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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

PUBLISHED EVERY WEDNESDAY BY
THE E. L. POWERS COMPANY
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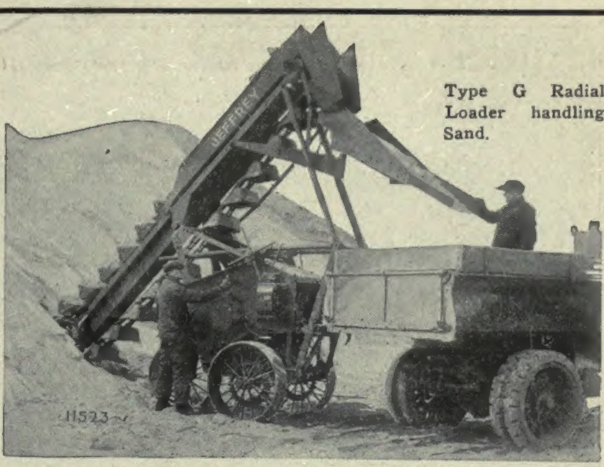

Type G Radial Loader handling Sand.

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You cannot afford to keep trucks and drivers waiting or load materials by the expensive man-handling method.

Install **Jeffrey** **RADIAL LOADER**

as concerns everywhere are doing for handling sand, gravel, crushed stone, coal, ashes, etc.

Radial Loaders are powerful self-feeding mechanical machines that will do the work of five to ten men quicker, at less cost and with less supervision. Dig 8 to 10 feet into the pile.

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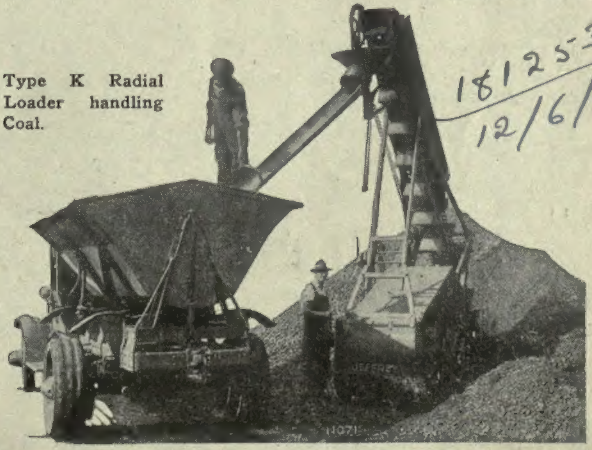

Type K Radial Loader handling Coal.

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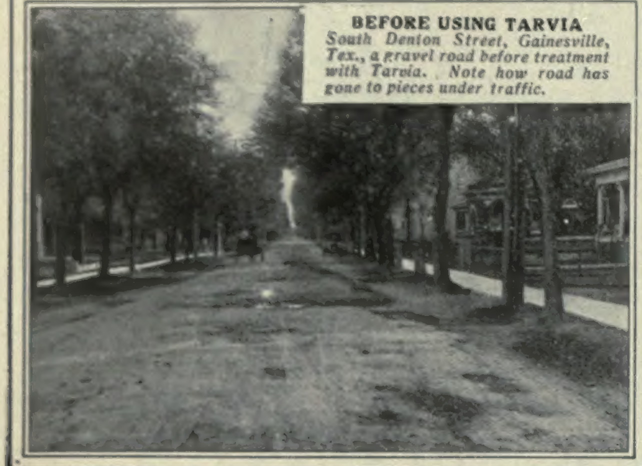
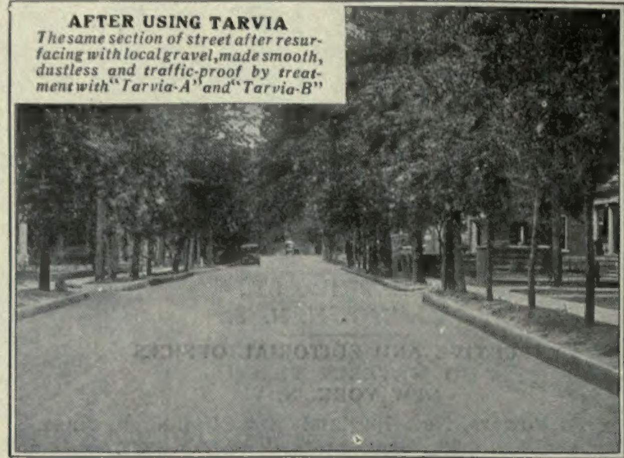


BEFORE USING TARVIA
South Denton Street, Gainesville, Tex., a gravel road before treatment with Tarvia. Note how road has gone to pieces under traffic.



AFTER USING TARVIA
The same section of street after resurfacing with local gravel, made smooth, dustless and traffic-proof by treatment with "Tarvia-A" and "Tarvia-B"

"There are no arguments against saving what you've got"—

THE war taught us many things, not the least of which was thrift—pertinently termed "saving what you've got." Thrift showed us that last year's shoes could be resoled and that the old suit—with little mending and pressing—had another year's wear in it.

It showed many cities and towns that the policy of "saving what you've got" could be applied to their road problems. They reasoned this way:

"High costs may offer good arguments for delaying new road construction at this time, but *there are no arguments against saving what you've got.* To neglect the roads already built is waste, and *waste is a crime.*"

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GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE
WITH WHICH IS INCORPORATED
THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX
JAMESTOWN, N. Y., JULY 7, 1920
Number 1

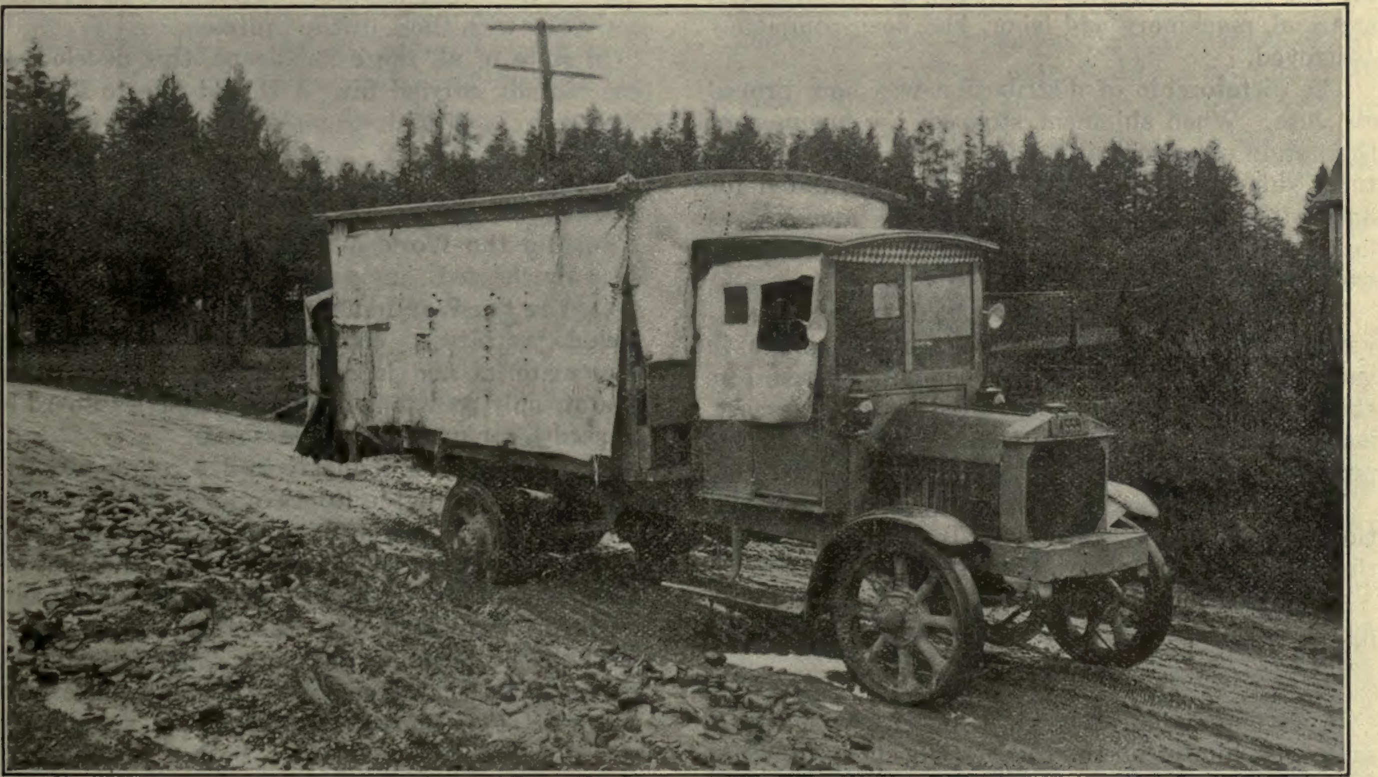
Relation of Highway Transportation to Increased Production-I*

By GEORGE M. GRAHAM†

I beg to direct your attention to an investment that offers an almost unlimited return to our people. My topic is not alone one of business.

There is increasing among the nation's constructive leaders a patriotism based on practical considerations. This patriotism believes that the greatest good to the greatest number can best be achieved by an enhanced development and distribution of our natural resources. It is to those who hold with this view that I address myself today.

The advocates of highway traffic are proud to plead their cause from the same platform as their elder brothers in transportation, the railways and the merchant marine. We have no thought to be their rivals. We aspire to supplement them in a transportation trinity, as suggested by former Secretary of Commerce Redfield.



ONE OF THE FLEET OPERATED BY THE HIGHWAY RAPID TRANSIT BETWEEN PORTLAND AND SALEM, OREGON—TAKEN ON A BAD PIECE OF ROAD, ONE OF THE OBSTACLES TO MOTOR TRANSPORT.

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*Paper presented at the eighth annual meeting of the Chamber of Commerce of the United States of America, Atlantic City, N. J., Apr. 27-29, 1920.

†General Sales Manager, Pierce-Arrow Motor Car Co.; Member, Motor Truck Committee, National Automobile Chamber of Commerce.

The relation of all three traffic factors in respect to production would seem to be definitely established. Our merchant marine maintains our contact with the outside world and also moves freight over our inland waterways. The steel rail has ever been the herald of development and progress, but experience has shown that the profitable operation of railroads is largely a matter of bulk shipment over extended distances. The highways offer an infinite possibility of local communication.

Increasing production rests mainly on enlarged highways transportation, perhaps the least developed of our great national assets. The highway can aid the railways in the immense task of serving 105,000,000 persons, spread over 3,000,000 sq. mi. It directly touches the home life of more people than all other transportation mediums combined.

As we sense production, there are four main kinds, which I range in the order of their importance: First food; second, fuel; third, raw material; fourth, manufactured articles.

All four kinds of production depend on consumption, and the connecting link between the two is transportation. Wherever we can more closely join the point of production with the point of consumption we assure increased output.

We have seen within the last month the deadly effect on production of interrupted railway facilities. A few thousand switchmen at various points suddenly discontinue work. The result is a widespread paralysis of production, as complete as though for the time being the essentials of manufacture, material, machinery and labor, had been completely destroyed.

The dictatorship of distribution was here proved absolute. When shipment stopped, the business of the nation was prostrated. Consumer and manufacturer suffered alike. While the former waited for delayed shipments, business shrank, money was lost, and public convenience, health, and even life were placed in jeopardy.

The producer experienced equal distress. His inventory piled up. He sought storage facilities in vain. Capital lacked to run his business. Even if he still had raw material, he hesitated to produce more, lest he merely increase congestion and aggravate his problems. So production lagged and prices mounted.

Virtually every economist will prescribe production as the remedy for most of our present ills. It is the answer to high prices. It is the nearest approach a panacea for labor disputes. It is the medium of mercy to Europe.

Effect of Transportation on Prices

If anyone doubts how far transportation affects prices, let him recall the the great obstacle to necessary increase of railway freight rates is the fear that such a raise will add to virtually all living costs.

Freight now moves over the United States via the following: 15,000 mi. of canals and inland waterways, 259,000 mi. of railways, and 2,753, 334 mi. of highways.

In discharging its distribution function, the highway presents potentials not generally understood. The total of surfaced roads in the United States is greater than the railroad mileage, being 296,290, 12% of the total, against 259,000 mi. of railroad. It should be freely conceded, however, that much of what is here termed surfaced road is basely passable.

Exact tonnage figures are not available. The best estimates show that on the Great Lakes and Mississippi in 1918, 90,000,000 tons of freight were carried. In the same year 2,504,000,000 tons were moved by rail, and 1,200,000 by motor truck.

Highways have fallen short of carrying their share because only within the decade has a medium been developed to escape the limitations of the man-drawn, ox-drawn and horse-drawn vehicle, used for fifty centuries.

Many elements have combined to prevent the rapid application of the motor truck to highway transportation. It was not like Adam, born mature. It had first to be perfected that its efficiency might declare itself.

We have been hampered by ill-considered and in many ways unjust legislation. Bad roads have retarded our development, and in this connection I ask you to note that our trucks have been just as much sinned against by bad roads as they have sinned by damaging such roads.

But the greatest immediate obstacle to the expanding use of trucks has been our failure to fit in our activities with those of the railroads.

In spite of all these handicaps, this development has already carried far. I should like to illustrate the progress with an example from official records.

Importance Recognized by War Industries Board

During the World War the most drastic powers ever vouchsafed any governmental agency were vested in the War Industries Board. These powers included arbitrary control of fuel, transportation, raw material and labor. The manufacturer could operate only providing the War Industries Board had classed his output a war essential.

The motor truck industry in due course was summoned to Washington to prove its case. It was told that, with steel lacking for war purposes in France, the misuse of one pound was treason, and that only under conditions of utmost urgency could steel be granted for trucks to be used in this country.

The reply made by the motor truck industry best proves the place taken by the power vehicle in our transportation fabric. Its spokesman submitted to the War Industries Board a list of the industries the Board itself had voted to be essential to the war program. There were 71 kinds represented. All carried full priorities.

An analysis showed that of the 71 kinds of manu-

TRUCK OPERATING REGULARLY BETWEEN CLEVELAND AND ALLIANCE, HAULING PRODUCE

facture, 66 were using motor trucks to speed up production. These included thousands of the biggest firms in the United States. The Board immediately granted the steel.

I believe that an almost equally forcible case could have been made for the passenger car, for that too must be considered in all questions involving highway transportation. The utility use of the motor car has won for it a place as a staple commodity. It is essentially a transportation medium.

Passenger Cars Furnish Individual Transportation.

The only usual difference between the truck and the car is that the truck transports freight and the passenger car transports persons. The difference between the passenger car and the railroad car is that the latter carries persons in number, whereas the automobile furnishes an individual transportation of infinite convenience and advantage.

We believe that the good will of railway officials to highway transportation is near at hand.

During the war Director Hines urged that wherever possible freight should be diverted to motor trucks to lessen rail congestion.

"Considered as a unit, practically none of the small branch railway lines feeding trunk lines pays expenses. The traffic gathered by them is turned over to the main line with a deficit attached, which has to be overcome during the main line movement before any profit is made. It would be a decided advantage if this traffic could be delivered to the trunk line by means of motor truck."

R. C. Wright, General Traffic Manager of the Pennsylvania Railroad, has stated that there is small advantage in handling l. c. l. freight up to 40 mi. His advocacy resulted in the appointment of a committee from the American Railway Association to analyze the short-haul conditions and to welcome overtures from reputable motor truck companies to handle such freight.

We do not like to dwell unduly on the war as having established the place of the truck, yet beginning with the President of the United States, it would be possible to quote virtually every war official of prominence in witness to the practical aid given by motor trucks. Surely this service can be extended to peace needs.

Railroads have learned that prosperity cannot be defined alone in terms of tonnage.

Formerly, the railroad, in its capacity as a public carrier, was not in a position to refuse unprofitable freight. Now, this can be diverted to a new and suitable medium, which permits the railroad to concentrate on profitable freight.

Temporarily, our railroads have reached the limit of their capacity. As now equippel, they can handle no greater volume. "Railway Age" says they are 712,400 freight cars short. Only 50% of locomotives needed are available. Five years is suggested as the minimum time in which railroad facilities can be brought to normal.

Meantime is it not sound logic that present railroad equipment should be limited to remunerative work, leaving the short haul, l. c. l., to other mediums?

No rational person considers the motor truck a rival of the railroad in long-haul traffic.

Trucks Cannot Compete with Railroads over Long Distances

The truck has performed wonders in occasional emergency service, but the labor factor eliminates it for long distance work.

A modern freight train will move 3,000 tons with a crew of 6 men. The same tonnage by motor truck would require 600 5-ton trucks, at least 600 drivers and possibly 600 helpers.

That there may be wisdom in a rearrangement of our present methods is suggested by a brief analysis of the facilities of the short-haul steam railways of the United States. This class I have limited to railroads having a maximum trackage of 100 mi., although many lines with more than this render a short-haul service.

Short-Haul Lines and Their Equipment

The figures were obtained from the Short Line Association, and are accurate, as of April 1st. They

TRUCK USED IN THE STATE OF WASHINGTON FOR HAULING LIVE STOCK TO MARKET show 659 roads of 100 mi. or less. Their total mileage is 16,860, an average of 25.6 mi. each; 160 are less than 10 mi. in length, their average being 6.4 mi.; 419 roads are less than 25 mi. long, their average being 12.6 mi. The total number of locomotives, of the 659 roads, is 2,491, an average of 4 each; 133 roads have but one locomotive.

A foremost railroad authority has frankly conceded that no longer will such lines be constructed either as individual lines or branches of trunk lines.

If Mr. Wright is correct in his figure of 40 mi. as the minimum distance for l. c. l. haulage, then there is no place for almost two-thirds of them. The future tendency will be to substitute other agencies.

In planning to eliminate such roads there arises the problem of taking care of their owners. Stockholders should be protected, but a system which is economically in error cannot be maintained artificially.

In many cases these lines were established by trunk railroads to serve as feeders. Their stockholders might be compensated through an exchange of their securities for stock in the parent company. It is possible also to sell at profitable prices all equipment, including rails, freight cars and locomotives. In some cases terminals might be taken over by trucking companies.

Typical Case of Truck Line vs. Railroad

There is also the suggestion that stockholders in short-line railways might themselves embark in motor truck haulage. In connection with the growing rivalry between short-line rail companies and motor truck haulage concerns, I have selected from a mass of litigation one case that is typical. It shows all the arguments, good and bad, all the handicaps and possibilities, of both sides.

This case was heard before the Public Service Commission of Nevada. It concerns the effort of two Italians, Ginocchio Brothers, to get a certificate of public convenience to operate a motor truck haulage company. Opposed to them was the Virginia & Truckee Railway Co., operating between Reno and Minden.

The railway company had much on its side. It was in possession of right of way, and claimed to be operating satisfactorily. It paid its taxes. It asked that Ginocchio Brothers be compelled to deposit bonds to the amount of $10,000, establish freight stations and passenger depots and adhere to complete tariff schedules. It argued that the truck company could not operate during part of the winter, whereas the railroad was an all-year service.

But especially instructive was the railroad's presentation of the financial phases of the subject. It was set forth that the net income was only $8,845 for the year ending June 30, 1919; that the scrap value of the railroad was $450,000; that if the owners saw fit to junk their assets and invest in staple securities, they could get an income of $27,000, or three times as much as their operating gains.

It was also urged that the addition of another carrier would depreciate the revenue of the railway and result in poorer service and higher charges.

Ginocchio Brothers argued service. They proved that their trucks covered 51 mi. between Reno and Gardnerville in 3 hours and 20 minutes, picking up and delivering freight at residences, farmhouses, warehouses, and stores. Two or three days elapsed in similar railroad freight shipment.

The truck service was said to be no more disqualified by storms than that of the railway.

Many customers supported the Messrs. Ginocchio, and said they gave a service not possible by the railroad.

The commission ruled that railroad freight service for short distances in less than carload lots has become wasteful and obsolete. It granted the right of operation to Ginocchio Brothers, welcomed the addition of such service for the agricultural, live-stock and mining sections of the state, and recommended that the railroads install similar facilities.

Properly speaking, there never should have been any conflict in this case. Under a proper system of cooperation, the effort would be to find out which of the two mediums could most economically, efficiently and profitably serve this section. This determined, the right facilities could be applied, and the other withdrawn.

Truck Lines and Railroads Should Cooperate

With cooperation and constantly increasing efficiency, motor trucks should be able to serve the great central trunk railway lines by hauling to them, free of deficit, a volume of tonnage to be moved distances in bulk.

State utilities commissions everywhere are studying highway motor transportation. Such researches divulge amazing instances of service. There is one 40-mi. route between Akron and Cleveland, which relieves the railroad between these cities of a demand for 800 freight cars weekly, suggesting a possible yearly saving of 40,000 cars for other purposes.

The great strain on our modern transportation systems is to be found at the terminals. Freight cars move on an average of only 25 mi. per day. We also have the spectacle of something like 2,400,000 freight cars, with an average capacity of 50 tons, carrying seldom as an average more than 32 tons in carload lot shipments and 7 tons in l. c. l. shipments.

If we could, by abolishing junction and terminal delays, bring the daily average mileage up to 37.5 mi. per car, there would be the equivalent of an addition of 1,200,000 cars.

At such centers as New York, Cincinnati, Minneapolis, Cleveland, Louisville, Grand Rapids and St. Louis, motor freight terminals are exercising important influences on transportation and production.

In New York, trucks collect freight from various points within a radius of 30 mi., then haul it to an

(Concluded on page 11)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX JULY 7, 1920 No. 1

REGULATING MOTOR TRUCK HAULING

There can be no doubt that regulation of motor truck hauling will have to be undertaken in the not far distant future. Indeed, steps have already been taken in some localities.

Two objects demand such regulation. One is keeping rates low enough to make motor truck transportation an object to shippers and the other is keeping rates high enough to make the business of truck hauling profitable to those engaged in it. In other words, there are two apparently—but only apparently—conflicting interests to be looked after.

If the business of transporting freight—and passengers—over the highways is left to develop without regulation, two evils are likely to arise, depending upon local conditions. If there is a lack of competition, charges are likely to be so high that all possible advantages of this means of transportation will be nullified. On the other hand, if there is too sharp competition, rates are apt to be forced down to a point that will leave no profits and that will mean poor service or none at all.

Both of these conditions must be prevented, if motor truck transportation is to attain its maximum usefulness. And they can be prevented only by proper regulation.

But the formulation of regulations requires the most thorough and painstaking investigation and study. Restrictive measures are to be avoided and everything possible done to foster the growth of the business. The whole subject is one which highway engineers might well give their most careful consideration.

MARKETING HIGHWAY BONDS

The high price level of all commodities has occupied the attention of the nation for the past two years. Production inadequate to an increased demand, a quantity of money in circulation double that of ante-bellum years, and other causes, have created high prices and a seller's market. While business men are cognizant of this fact, one phase of the situation has often escaped observation, namely that possessors of money are demanding higher interest rates.

To cope with the unfavorable money situation, states and counties have pursued different and often opposite policies in the marketing of highway bonds. Illinois has decided to undertake no new work and will hold the $60,000,000 bond issue until there is a more stable market. The Ohio Legislature has raised the legal interest rate on highway bonds from 5% to 6% so that the counties can secure money to proceed with highway improvements.

Financing road improvement is a serious problem at the present time and highway officials should consider carefully the possible ways of marketing bonds. Increasing the interest rates from 5% to 6%, as Ohio has done, means an increase of 10% in the combined principal and interest cost in the case of 20-year bonds and 12% in the case of 30-year bonds. Not only does the throwing on the market of large blocks of first-class securities bearing high rates of interest affect present road building costs, but tends also to cause a permanent high interest rate which will be reflected in higher costs for future work.

But highway bonds must be sold. The country is in greater need of good roads than ever before and communities, in general, are satisfied that the benefits derived will outweigh the cost. But however great the value of good roads, their cost should not amount any higher than is absolutely necessary. The problem is to get the most mileage by stopping, so far as possible, the shrinkage of appropriations.

In view of this, the method pursued by Wexford County, Michigan, in securing a market for highway bonds is of particular interest. Because the state was unable to dispose of its $50,000,000 bond issue, notwithstanding an increase in interest rate, Wexford County was confronted with the possibility of no road improvement this season. To overcome the difficulty, citizens of the county subscribed to the necessary bonds. The Michigan State Highway Department acquiesced to the plan and Wexford County will have its road improvements.

The example of Wexford County suggests the possibility of similar action in other like cases. Would it be well for states and counties to adopt Liberty Loan methods of marketing bonds and keep the interest rates within a reasonable limit? If the State of Illinois can not sell its $60,000,000 issue in the usual way, would it not be possible to sell the bonds to the people of the state on reasonable terms?

Such procedure might prove the solution of the problem. A bond issue could be allotted to the various sections, and banks, automobile associations, chambers of commerce and other organizations appointed to carry out the campaign. It is not unlikely that a group of people who voted for better roads would lend their money to build those roads, especially when shown that such action would result in profit to themselves and to the state.

Surplus War Equipment Bill Fails

The bill providing for the transfer of additional surplus war equipment to the various states for road building purposes was not signed by the President during the ten-day period following the adjournment of Congress and so becomes automatically lost. The bill which passed Congress provided for the turning over of tractors, mobile machine shop units and other equipment for use in road building by the states.

Proposed Freight Increase Will Add $1,000 a Mile to Road Building Cost

Transportation Costs on Sand and Gravel Have Doubled Since 1916, Say Producers

An increase of $1,000 per mile in the cost of road construction is predicted by members of the Advisory Council of Sand and Gravel Producers if the proposed increase in freight rates on sand and gravel is granted to the railroads.

Representatives of producers of these road materials recently appeared before the Interstate Commerce Commission to protest against the advance in rates asked by the railroads, pointing out that 90% of the sand and gravel transported by the railroads is produced within 75 mi. of the point where it is used. On this basis, the freight rates on sand and gravel are approximately double those in effect in 1916 and it was contended that further increase of rates would be unjustified and add materially to the cost of road building. Already $1,200 per mi. has been added to road costs by the increases of freight rates during the war, it is stated.

It was also contended by the representatives of the sand and gravel producers that their shipments were discriminated against in the present shortage of open-top cars in favor of the coal industry, producing facts and figures to back up their statements. The rationing of cars in favor of the coal industry was attacked on the ground that the producers of coal, by various methods, had brought about a false famine and it was pointed out that on practically every railroad line in the country, thousands of open-top cars, suitable for carrying sand and gravel, were lying idle, empty and filled, and choking traffic because of the vast number of cars used in this one industry.

Arizona County Lets $4,000,000 Road Contract

A contract for road construction has been let by Maricopa County, Arizona, to Twohy Bros., Seattle, Wash., at an estimated cost of approximately $4,000,000.

The county had planned an extensive system of hard-surfaced highways of 283 mi. total length and at the time when bonds were issued for the carrying out of the program it was thought the $4,000,000 issue would be sufficient. However, with the increased cost of road construction, it will take double the estimated cost to carry out the original program. A movement has been started in the county to float additional funds to carry out the plans.

The contract let calls for 9, 16 and 18-ft. one-course concrete construction with a thickness of 6 in. Construction will be started at once. About 300,000 cu. yd. of excavation is included in the contract and grading will be done for the entire width of the road on all sections, notwithstanding the width of surfacing. As the bids left the amounts of pavements of the several widths to the option of the Maricopa County Highway Commission, no total contract price is yet available.

Iowa Compiles Cost Data on Road Grading

Moves 80,000 cu. yd. of Earth at Average Cost of 52 ct., with Rented Equipment

In an attempt to ascertain the cost of road grading work under actual working conditions, the Iowa Highway Commission rented the equipment of two contractors last year and graded the Montgomery County federal aid road. Bids had been received at 55.5 to 60 ct. per cubic yard, and were considered too high by the commission.

The work was started during the latter part of July and dirt was moved for as low an average as 30 ct. during the first few weeks. Later more difficult work was encountered, sand having to be removed for long stretches and considerable earth filling having to be put in on the grade. There was considerable grubbing and removal of trees and stumps, over 2,500 sticks of dynamite being used. One 13-ft. cut and one 16-ft. fill were encountered and at the end of the working season 80,000 cu. yd. of earth had been moved at a total cost of $50,987.56, an average of 52 ct. per cubic yard.

This season the commission has five outfits at work including the two of last year, and the cost data secured are expected to be of considerable value to the commission in showing to what extent costs have advanced in road grading work.

Asks Reduction in Salary

L. A. White, Engineer of El Paso County, Texas, has requested that his salary be reduced $600 per year, according to "Texaco Tips." Mr. White has also recommended that the county award no more contracts for road construction until prices are reduced.

Proposed Ordinance in Denver, Colorado, Bars Horse Traffic

An ordinance has been introduced in the city council of Denver, Colo., which proposes to prohibit horses on the streets of that city after Jan. 1, 1925. The bill provides that no cattle, sheep, swine or horses shall be kept within the corporate limits of the city and permits the setting aside of certain parts of the city, other than residential or business sections, for the location of stock yards and packing houses.

Light Colors for Bridge Paints

The use of paints of light colors, as canary yellow, pearl gray or light olive green, in painting steel structures, was advocated at the recent meeting of the American Railway Bridge and Building Association, by J. R. Shean, of the Pacific Electric Railway, Los Angeles, Cal.

Since the resistance of light colors to heat of the sun's rays is greater than that of the darker colors, the paint would be more enduring and adhere better to the structure. It was also pointed out that light colors have a longer life than dark colors, thus equalizing any difference in cost, and at the same time making structures more pleasing to the eye.

Delaware to Carry Out 1920 Road Program

Will Use Asphalt in Completing Mileage Because of Shortage of Cement Shipments, According to a Recent Official Statement

At a conference held on June 21, by the Delaware State Highway Department, it was decided that it would be very inopportune to retard the procedure of the 1920 program.

The original program included approximately 80 mi. of concrete highway, but only about half of this has been placed under construction. After carefully considering the present situation, it seemed somewhat doubtful about placing any more concrete highways under construction on account of the lack of cement shipments. No difficulty has been experienced in securing asphalt and stone shipments and it was, therefore, agreed that the program should not be held up, but that asphalt wearing surfaces should be laid on bituminous foundations. Plans are now being completed and bids will be asked about the middle of August. Approximately 40 mi. will be included. About 15 mi. of asphalt surfaced road was built in Sussex County, with results that have proved very gratifying to the users of these highways.

It was hoped that the main system of the state could be constructed of concrete or concrete foundation but the demand for the completed roads and the condition of cement shipments have made it necessary to use asphalt construction.

Italian Experimental Road Work

The Italian Touring Club has recently organized an "Experimental Institute of Roads," placing it under the direction of Sig. Italo Vandone, formerly Chief Engineer of the Province of Milan.

The objects of this institute are to proceed with laboratory experiments on road materials, to assist the progress of experimental work on the surfacing of highways, to study design and materials of highways, to cooperate with similar organizations in other countries and to collect and disseminate data and information tending toward the development and improvement of road work in Italy.

The institute publishes monthly the result of its proceedings which serves as an organ of propaganda for the maintenance of roads and also as a vehicle of information on all new matters of road technic in Italy.

Iowa State Highway Commission Upheld by Court in Contract Disapproval

Decision in Mandamus Suit of Contractor To Compel Commission to Approve Contract Let by Polk County Affirms Commission's Discretionary Right to Reject Contracts

The right of the Iowa State Highway Commission under existing laws to approve or refuse to approve contracts for highway improvement was upheld by a recent decision of the Story County District Court. A mandamus suit against the commission was instituted by Thomas Carey & Sons, contractors, following the award to this company of a contract by the Board of Supervisors of Polk County for the construction of 1.5 mi. of bitulithic pavement.

Bids for this work were first received on August 25, 1919, and were rejected as being too high. Bids were again received on August 30, and on September 6 the Board of Supervisors awarded the contract to Thomas Carey & Sons, for the costruction of a bitulithic pavement at a price of $4.09 per square yard. This contract was forwarded to the State Highway Commission for approval, in accordance with Section 11, Chapter 237, Acts of the 38th General Assembly.

The contract was disapproved by the commission on the ground that with a bid price of $3.33 for concrete, the price of $4.09 was not justified for bitulithic. The contractors then filed mandamus suit asking the court to direct the commission to approve the contract. The decision rendered upholds the State Highway Commission and establishes the discretionary right of approval or disapproval over road improvement contracts under present highway laws.

HIGHWAY TRANSPORTATION

The Regulation of Motor Truck Service*

The Truck's Value in the Marketing of Foodstuffs—The Relation Between Truck Lines and Railroads—Problems Incidental to Regulating Truck Haulage—Its Future

By JOHN J. ESCH†

As to your policy "to assist in coordinating highway transportation with the other transportation agencies of the country; to encourage the development of highways that will advance the economic life of the nation; stimulate their use in such a manner as to facilitate and cheapen the transportation of food, raw materials, and finished products, and cooperate with government agencies, both state and national, to the end that our highways may be of maximum service in the transportation system of the country," I most heartily approve and endorse your cooperation with the railroads and waterways "to the end that the public may have in full that form of transportation which is most efficient, economical and practical."

I do not believe that men can devote their time and attention to a more important phase of economic development than that to which you are now directing your attention. The motor truck is no longer a toy of the rich. It has become essential, as is evidenced in present transportation. The fad has been squeezed out and we now have a practical thing, due largely to the enterprise and courage of men like yourselves. The motor truck is an advantage to the farmer, to the consumer, to the railroad, to the general public and to our Government. Possibly it is more directly concerned with the farming community in that it affords the farmer means of bringing his farm nearer to the market, and anything that brings the farm nearer to the market helps not merely the producer but also the consuming public. By increasing the facilities of commercial life you advance the rural life of any community. It is nothing less than a crime in many parts of the United States to permit the destruction of necessary food crops because of the lack of speedy, reliable transportation; and from what we read farmers are permitting their tuber crops to rot in the soil or their fruit crops to rot on the ground because there is lack of facilities for such transportation. You gentlemen can help to prevent the crime. You are doing an act of humanity. The average farmer produces in small lots, vegetables and fruits, and, therefore, must do his own hauling. That means loss of his time or loss of the time of his hired help. One way to solve the labor problem on the farm is to allow the farmer to stay on the farm and his animals to work on the farm and not compel them to make trips to the market. Let the motor trucks do this and save hours of his time and the time of the horses. I thing Mr. Fenn, who is here, made a statement in an article in a magazine that whereas a village now enjoys a farmer's truck within a radius of 5 mi., by the use of rural motor express this radius could be increased to 7 mi. and the territory supplied be doubled.

There are many places in the United States where railroads do not obtain, where it is not possible to build a road, because of topographical difficulties or because of a lack of means. May it not be hoped that the motor truck may supply interior points now inaccessible? It will help the farmer to bring his crops, vegetables and fruits to the doorway of the consumer, in less time and in better condition than is now possible under existing transportation facilities. I do not wish to declare all middlemen to be unnecessary, but you know that there is a widespread impression that they are getting too much. May it not be possible that his elimination to some extent may be wise and justified under the circumstances and may it not be possible that the use of the motor truck may in some degree eliminate some of them who are now living upon both the producer and the consumer? The motor truck can expedite transportation and anything that speeds up delivery is an advantage to both the producer and consumer.

The motor truck will help the railroads. Gentlemen, when the great problem of the country regarding the return of the railroads to private operation was presented to Congress over a year ago, I felt that it might be wise to include in such legislation a provision with reference to motor truck transportation. I gave out an interview in January, 1919, looking to this end. It was widely commented upon by the public press and I received many communications from individuals, corporations and chambers of commerce with reference to the proposed plan. I also received many communications from automobile manufacturers, trailer manufacturers, automobile organizations, individual manufacturers, and consumers; and the consensus of opinion, based upon these communications, was that the state of the art was not such as to justify the inclusion of motor truck service in the provisions of a bill returning the roads to private operation. I was persuaded, after reading this correspondence and having talked with men who seemed to understand the subject matter, that it would be wiser to eliminate from the provisions of the railroad bill all reference to motor truck service. During the hearings on the railroad bill motor truck service was discussed by several witnesses and all agreed that the time would come when it would be necessary to have regulation of motor truck service, state and federal, if this service was to be properly coordinated with rail and water transportation. This accounts, gentlemen for any absence of law relating to the motor truck service in the Railroad Act.

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*From an address before the Transportation Committee of the Federal Highway Council, Washington, D. C.

†Member of Congress from Wisconsin, Chairman of the House Committe on Interstate and Foreign Commerce.

With reference to motor truck service as it relates to the railroads, I am of the opinion that, whereas there may be a widespread prejudice on the part of the railroads against this service, due to prospective competition, I believe that through coordination of the two the motor truck will supplement the rail service to the advantage of both. There are places where it will not pay to build a short-line feeder, but those places can be supplied by motor truck service, provided good and sufficient highways are provided and properly maintained. A motor truck service, by extending into the back country, to the inaccessible regions, becomes a feeder to the short line. In my opinion, the motor truck line can become as much a feeder as some existing short lines are now feeders to trunk lines. I, therefore, do not believe that some of the prejudice which now exists against the further extension of motor truck service is justified. Are the motor trucks of any special benefit to the Government? Yes, in time of war emergency they become absolutely necessary. You only have to ask the army officers present as to the part they played in France and Belgium, how they kept the lines of communication open and brought the army close to the base of supply—making it comparatively easy to furnish the men with all needed supplies. Motor trucks are already acknowledged to be an essential element in war preparedness, but they are necessary to the Government also in periods of great congestion. In the congestion in the beginning of 1917 and all through 1917 and during the fall and winter of 1917 and 1918 the motor truck came into use in many parts of the United States and relieved the congestion which had become unendurable. In the large centers of population where, due to constricted terminals which cannot be enlarged because of prohibitive costs, it is impossible at times to move supplies and perishable fruits without the use of the motor truck. Already motor truck service has been relieving large cities in periods of congestion, with hauls of from 50 to 100 mi. You all remember what part the motor truck played in the recent railroad strike in Great Britain. You remember how the government commandeered thousands of lorries in order that the population might not starve. It was because the motor truck was available that starvation was prevented and the strike came to an end. Like conditions may present themselves in the United States. Last summer when the shop men in certain sections went out on strike the people of Macon, Ga., mobilized the truck service of that city, established traffic areas and made experimental deliveries on various roads of different character, showing that they could move 300 tons a day by motor truck into that city at a cost of 5 ct. per ton per mile. When that fact was made known to the citizens of Macon, they felt that they were comparatively free from the dangers of a railroad strike and a like situation will doubtless be presented in many other cities, should we be forced to a country-wide rail strike.

While I have thus advocated motor truck service and shown in a rather scattered way its advantages to the various classes, the farmer, the consumer, the railroads and the Government itself, I do not wish you to infer that there are not problems which must be solved in connection with this service. A motor truck service is doubtless under the common law a common carrier. In most cases it is not a corporate entity. It is operated, as a rule, by private individuals.

Railroads, on the other hand, are corporate entities, owning their rights of way with the right to control the traffic of their own lines, subject to regulation and control either by state or federal regulatory bodies. Can a motor truck line be given such exclusive use of the public highways between given terminals as to enable it to get the business between such terminals to the exclusion of any other motor truck line or individual truck owner who might temporarily or permanently seek to do business? Unless the established line were given protection, could it survive? Supposing a motor truck service were established between this city and Baltimore. Could it be given such exclusive right to transact business over the public highway, under rates prescribed by federal authority, without protecting its business against the competition of a rival not subject to control? In other words, can any one who so desires use the public highway to carry traffic thereon at whatever rates he sees fit to charge and thereby lessen or destroy the traffic of the service which is under regulation?

If motor truck service is to be regulated it can be of most service by establishing through routes with joint rates and through bills of lading. Through billing would be of great convenience to the interior shipper or merchant, but if through bills of lading are to be granted they should be properly protected. Under the Transportation Act recently enacted we gave to the Interstate Commerce Commission increased power of the division of rates. Without just and proper division of rates, the motor truck line might find it impossible to survive. In determining the division of rates to which the motor truck line is entitled, the Interstate Commerce Commission or other regulatory body would have to determine the cost of the service rendered by the motor truck line. But as yet we have no sufficient data to determine such cost, the cost varying with the character of the road, the character of the truck used, the length of the haul, and many other elements. Time will be required before sufficient data can be secured to enable

(Continued on page 10)

EQUIPMENT—TRADE—MATERIALS

Asphalt Filler Solves Noise Problem on Hospital Street

One of the most perplexing problems recently confronting the street department of Murphysboro, Ill., was the elimination of noise produced by traffic on the brick pavement on the streets surrounding one of the local hospitals. The continuous and aggravating noise caused by the clanking of the shoes of the horses on the hard pavement was finally done away with by a simple and inexpensive remedy.

The city officials concluded that the application of asphalt filler would deaden the noise and at the same time permit the continued utilization of the brick pavement. The surface of the brick was first thoroughly cleaned by flushing and Texaco asphalt filler squeegeed in at a rate of about ¼ gal. per square yard. Fine river gravel was spreaad over the surface while the asphalt was still hot and six hours later the street was thrown open to traffic. Three years have elapsed since this remedy was applied and it is reported that the noise has been lessened satisfactorily and that the surface of the pavement is in excellent condition.

Rock Asphalt Construction on Camp Knox Road To Be Extended

A contract for the extensio nof the Eighteenth Street Road at Louisville, Ky., for a distance of 11.1 mi. has recently been awarded. This road will be constructed with Kentucky rock asphalt and will extend to the Jefferson County line.

The section of this road already paved with rock asphalt has Camp Knox on one end and during the war carried the heavy traffic between this camp, Camp Taylor and an army supply camp across the Ohio River. It is estimated that an average of 4,000 vehicles a day (of 12 hours) passed over this highway for almost two years. Notwithstanding this heavy traffic, the road is reported to be in excellent condition today.

The 11.1-mi. extension is at present a 16-ft. macadam roadway, surface treated. The surface will be lightly scarified and covered with 3 in. of new metal and compacted. On the top of this, Kentucky rock asphalt will be laid cold and compacted to a thickness of 3 in. The roadway will be widened to 20 ft. and relocated for 4 mi. The grading will be done this year and the paving next season. New construction on relocated sections and a 2-ft. addition on each side of the macadam pavement are called for by the specifications. The pavement will consist of a 9-in. compacted macadam base with a 2-in. compacted Kentucky rock asphalt wearing surface.

J. H. Cahill, of Louisville, Ky., has been awarded the contract for the work.

Wood Blocks for the Philippines

The first shipment of specially treated wood paving blocks to be used in the Philippine Islands was dispatched recently on the steamship West Ivis, bound from Seattle, Wash., to Manila, via Oriental ports of call.

In order to withstand the tremendous heat of tropical summers, the blocks were specially treated with a creosote preparation by a Spokane contracting firm.

Seventy-five carloads of blocks are called for in the contract, 25 of which are included in the cargo of the West Ivis. Struthers & Dixon, steamship operators, expect to carry the remaining 50 carloads across this month, during which month they have three vessels booked for the Orient.

This paving material is contracted for with the Philippine Government and will be used for the construction of roads in the vicinity of Manila, the island metropolis.

The Warren Brothers Company, of Boston, Mass., has been awarded a contract for paving the Jamaciaway, in that city, between Huntington Ave. and Willow Pond Road. The lowest bidder was the Central Construction Co., with a price of $28,730 for sheet asphalt, the bid of Warren Brothers Company being $29,290.90.

The Regulation of Motor Truck Service

(Continued from page 9)

a scientific determination of the cost of service. Under the Transportation Act, we gave to the Commission power to fix both maximum and minimum rates on the rail haul. Should the regulatory body be given a like power over the charges made by the motor truck line, or should such charges be limited only to their maximum as in the case of water transportation? These are a few of the problems which present themselves for consideration.

There is a great future for the motor truck service, but it will take time and labor and numerous consultations before definite lines of policy can be finally determined. Meetings such as this are of much promise. Men interested in the manufacture of motor trucks, in manufacturing generally, in railroads, water lines, commercial bodies, representatives of railroads, of good roads associations, and farmers' organizations, should be called into conference and the entire question of motor truck development and service be considered from every possible angle. Full and free discussion should be had and resolutions adopted expressing the conclusions arrived at. These resolutions could then be presented to state legislatures and to Congress with a view to future legislation. I can assure you that when you have such a conference I would be glad to receive your conclusions and when you have formed concrete propositions ready to present I will be glad to aid in putting them in legal form and in seeking to secure their consideration at the hands of Congress.

Demonstration Truck Tour in New York State

The United States Government, in addition to numberless farm bureaus, farm leagues and kindred organizations, is putting forth all the means at its disposal to emphasize the fact that the prosperity of the nation depends upon the production of the farm. The alarming amount of farm lands lying idle in New York State has made people think.

For this reason the Buffalo Truck Dealer's Association, an organization of wideawake business men, under the direction of the agricultural department of a national tire company, has just finished a two weeks' tour of cities, towns and villages of New York state, giving to all classes of agriculturists demonstrations of the adaptability of the farm truck equipped with pneumatic tires. The trucks went into the wood-lot and into the plowed fields, they carried feed, hay, milk, gravel for roads, and even logs, in such rapid time that the farmers whose servants they were became amazed.

Meetings were held at all the night controls. At these meetings, Austin W. Carpenter, a dairy farmer and a member of the tire company's organization, spoke to crowds varying from 400 to over 1,000, with one of the trucks as a platform. Band concerts and dances were an every-day feature, the dealers digging down into their own pockets for the money with which to entertain their guests.

In addition to speeches favoring better transportation methods for the farm, the doctrine of cooperative dairymen's leagues and good roads was dinned into the ears of the farmers whenever possible. The tour did not favor the fine brick and macadam roads which connect the cities with one another. Indeed, they often spurned the good highways and sought out the dusty, muddy back roads in order to show the farmer what the truck can do.

Following Mr. Carpenter's nightly speech, a film called the "Go-Getter" was exhibited by a crew employed by the Western Electric Co. This company also furnished the lights for the tents used by the men on the tour as sleeping quarters whenever weather permitted.

The action of the film took place on a primitive farm in Le Raysville, Pa., the characters using the old fashioned back breaking equipment of the old-time farm. During the unfolding of the story, the company takes advantage of the opportunity to show the actual installation of a modern direct-connected power and light outfit, running water, electric irons, washing machines and cream separator.

Relation of Highway Transportation to Increased Production

(Concluded from page 4)

outlying terminal, Mott Haven, to escape central congestion. It is then shipped in railway freight cars to Boston and thence distributed by trucks within a radius of 30 or 40 mi.

This properly allots haulage—the short distance for the truck and the long distance for the railway. It eliminates two or three minor railroads and consequent congestion and delay at the junction points.

What Trucks are Doing for Cincinnati Terminals

The entire transportation industry of the United States is studying with interest the achievement of Cincinnati, recently informatively presented in the "Saturday Evening Post" by Mr. Hungerford.

In Cincinnati, railway terminals are bunched, yet owing to trackage congestion, an average of 2 days and 14 hours used to be required to move a freight car a few miles between stations. Now similar distances are covered in 14 minutes by 15 5-ton trucks, which transfer freight from terminal to terminal.

The trucks also tap the suburbs, bringing in freight in ample time for daily distance shipment in bulk, and saving anywhere from one to four days.

Every freight house has standard truck bodies which attach to the chassis. When the railroad car comes in, the freight is quickly snatched from it and allotted to bodies destined for the various stations. Only 5 minutes are consumed in taking off one filled body and putting on another.

The service releases, in a year, 66,000 box cars from trap work for profitable distance haulage. The cost is 80 ct. per ton, as against from $1.20 to $1.60 by previous methods.

Solve the terminal question, and you solve extravagant costs as well as time lost.

One expert, B. F. Fitch, President of the Motor Terminals Co., of New York and Cleveland, has said that the installation in the metropolis of a motor system similar to that of Cincinnati would save New York consumers $45,000,000 in freight costs yearly.

Many items of cost, inseparable from railway freight, can be eliminated when short-haul shipment is made by truck. Included in these are items of boxing, crating, demurrage charges, teaming between terminal points, increased weight caused by boxing, and much incidental labor and clerical work in connection with billing, checking, tracing, etc.

All these economies exert their influence on production costs and volume.

(To be continued).

Stone County, Missouri, failed to sell $100,000 in road bonds at a recent letting, no bids being received. Steps have been taken by the county court to have private individuals subscribe for the bonds.

MEETINGS

Calendar of Coming Meetings

July 6-8—Conference of Mayors and Other City Officials of the State of New York—Annual Conference, Jamestown, N. Y. Secretary, William P. Capes, 25 Washington Ave. Albany, N. Y.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

PERSONAL MENTION

H. G. Perring has been appointed city engineer of Baltimore, Md.

John E. Foote has resigned as city engineer of Little Falls, N. Y.

F. F. Miller has been appointed city engineer of New Castle, Pa.

E. E. Chadwick has been appointed city engineer of Winona, Minn.

Howard Stillwell has been appointed city manager of Sumter, N. C.

Henry E. Gabriels has been appointed city engineer of Watervliet, N. Y.

P. T. Huntington has been appointed city engineer of Chippewa Falls, Wis.

Joseph D. Williams has been appointed city engineer of New Britain, Conn.

E. H. McMillan has resigned as road engineer for Gilmer County, West Virginia.

George Garrett, City Engineer of La Grande, Ore., has been appointed city manager.

James H. Johnston has been appointed superintendent of highways of Providence, R. I.

E. S. Nettleton has been appointed city engineer of New Haven, Conn., succeeding F. L. Ford.

Henry E. Wolff has resigned as city engineer of Winona, Minn., to enter private practice.

J. B. Easter has been appointed district engineer of the 6th State Road District of New Mexico.

Henry V. Macksey has been appointed superintend- of public works of Framingham, Mass., resigning his position as superintendent of public works of Woburn, Mass.

C. C. Smith has resigned as city engineer of San Antonio, Texas, to enter the contracting business.

A. H. Krom, Assistant Secretary of the American Association of Engineers, has resigned to enter business.

B. E. Gray has been promoted to senior highway engineer, Bureau of Public Roads, and stationed in West Virginia.

Harvey Hart has resigned as city engineer of Mankato, Minn., and is now connected with the Barrett Paving Co., Minneapolis, Minn.

George K. Armes has resigned as assistant engineer and office engineer of the Florida State Road Department to enter private practice.

James W. Costello has been appointed head of the Division of Streets, Newark, N. J., which has been made by combining the bureaus having control of street cleaning, paving and regulation.

Charles H. Moorefield has been appointed chief engineer of the South Carolina State Highway Department. Mr. Moorefield was formerly district engineer with the U. S. Bureau of Public Roads.

OBITUARY

Henry C. Ostermann, Vice President and Field Secretary of the Lincoln Highway Association, died on June 8.

Beverly R. Value, President of the General Contractors' Association of New York, died in New York City on June 10. Mr. Value was born in Montgomery, Ala., in 1863 and at the time of his death was associated with several prominent engineering and contracting companies.

The Talbot County, Maryland, Roads Commission has been organized with J. Ramsey Speer, President; Robert R. Walker, Secretary and Treasurer; Fountain Jackson, Superintendent of Construction, and Richard Goldsborough, Clerk. Preliminary work is now being done and when money from the recent bond issue becomes available, considerable road construction will be undertaken in the county.

Bergen County, New Jersey, has let two contracts involving the expenditure of more than $600,000. The contract calling for the reconstruction of the Paterson Road, from the Carlstadt depot to the Passaic River, was awarded to the William P. MacDonald Construction Co., of New York, and G. A. Earle, of Hackensack, at $426,000. The contract for the reconstruction of the Ridge Road from North Arlington to Lyndhurst was awarded to M. J. O'Connell, of Hackensack, for $172,430.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

PUBLISHED EVERY WEDNESDAY BY
THE E. L. POWERS COMPANY
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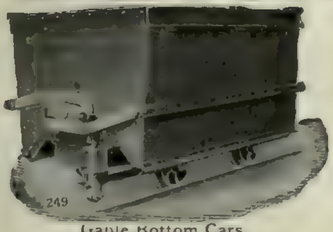
EASTON CARS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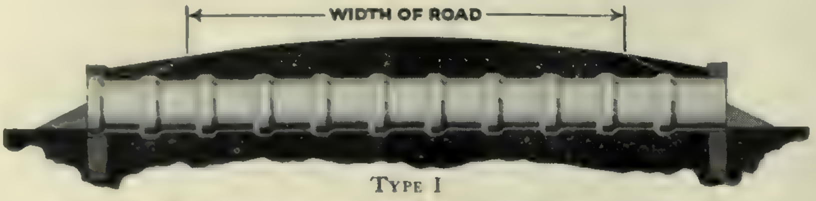
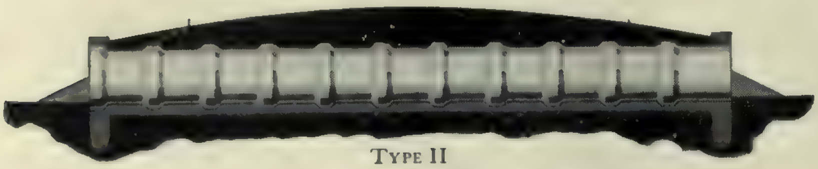


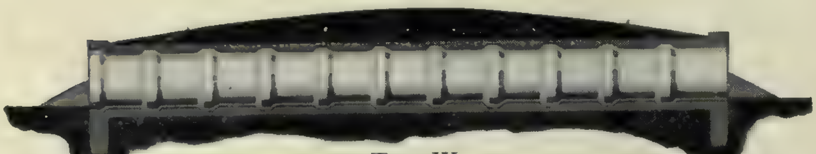
TYPE I

For location where a good solid earth foundation and a covering of at least 15" can be readily secured



TYPE II

For location where a good solid earth foundation is not available, but a covering of at least 15" is



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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX

JAMESTOWN, N. Y., JULY 14, 1920

Number
2

Relation of Highway Transportation to Increased Production-II*

By GEORGE M. GRAHAM†

(Continued from July 7)

Savings Effected by Otis Elevator Co.

W. J. L. Banham, General Traffic Manager of the Otis Elevator Co., presents a very interesting table, in which he shows how truck costs increase in proportion to the increased length of the haul.

10,000 Motor Haulage Lines

Ten thousand motor truck haulage lines are now registered with the National Automobile Chamber of Commerce by corporations or firms. This organization estimates that there are another 10,000 lines being operated by individuals who own and drive the trucks. Several of the corporations have made investments ranging from $1,000,000 to more than $2,000,000.

We believe that to prove our ability to facilitate delivery is to establish our helpful relationship to production. We should, therefore, like specifically to point out some phases of our service in the four main types of production. Food may well be dealt with first.

Importance in Handling Food

In the United States 26,000,000 food producers are trying to feed themselves, 79,000,000 additional American citizens, and many Europeans. It is an

	Road Miles	Freight Cost per 100 lb.	Motor Truck Cost per 100 lbs.
New York	12	$ .88	$ .15
Passaic, N. J.	6	.88	.15
Paterson, N. J.	10	.88	.18
Trenton, N. J.	51	.88	.55
Philadelphia, Pa.	88	.98	.75
Bridgeport, Conn.	70	1.12	.75
New Haven, Conn.	87	1.12	.85
Providence, R. I.	214	1.21	1.15
Port Jefferson, L. I.	71	.98	.75
Asbury Park, N. J.	46	.94	.45

Note: The article of which the above table is a part was printed in Good Roads for Apr. 21, 1920.—Ed.

A TRUCK IN RURAL MOTOR EXPRESS SERVICE BETWEEN THE FARMS AND MARKETS

MOTOR TRUCK MILK DELIVERY—AN IMPORTANT DEVELOPMENT OF HIGHWAY TRANSPORTATION enormous task. It has been made harder by waste from inadequate distribution. No less an authority than Herbert Hoover has said that 50% of the perishable farm produce in the United States rots on the ground, because of the farmer's inability to get it to market.

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*Paper presented at the eighth annual meeting of the Chamber of Commerce of the United States of Amercia, Atlantic City, N. J., Apr. 27-29, 1920.

†General Sales Manager, Pierce-Arrow Motor Car Co., Member, Motor Truck Committee, National Automobile Chamber of Commerce.

Over American highways pass a volume and value of food products of astounding dimensions.

Agricultural crops, dairy products, poultry, produce and domestic animal production reached in 1918 an aggregate of more than $21,000,000,000. There were 5,638,000,000 bu. of cereal; 11,818,000 bales of cotton; 309,109,000 bu. of potatoes; 197,360,000 bu. of apples; 6,449,000 tons of sugar beets; 10,500,000,000 lb. of pork; 589,000,000 heads of poultry; 1,921,000,000 dozens of eggs; and 8,429,000,000 gal. of milk.

United States Senator Arthur Capper, of Kansas, points out that the motor truck is essential to the development of the agricultural interests of America, and shows $70,000,000,000 to be invested in farms—a sum equal to the total of any three other industries that might be named.

Stimulating Food Production

Adequate transportation helps food production by exerting these four principal influences:

First, gives wider producing area.

Second, definitely lowers cost of foodstuffs without detriment to farmer by saving much excess transportation cost. This is important, because under present methods the farmer gets but $.35 for products which cost the consumer $1.00. This means that two-thirds of the $1.00 is expended in distribution.

Third, shortens time of transit to market, thereby increasing the farmer's producing hours on the farm.

Fourth, assures the prompt arrival of perishable items at the door of the consumer when they are in best condition and command the highest prices.

Trucks are being applied to food distribution in varied ways. The farmer hauls for himself and his neighbors. Local transfer companies are entering the field, but the biggest development is in the organization of what have come to be known as rural motor express lines. The Highways Transport Committee made itself responsible for this movement, when, during the war, it was straining every effort to increase the food supply.

There are now know to be 3,000 regularly established rural motor express lines in operation, and some of them involve a considerable investment. The number is constantly increasing. Their economics have not yet been reflected in any general decrease in food prices, mainly for the reason that the application has not become sufficiently general.

There are, in the United States, 6,361,502 farms. All over 80 acres could find profitable use for one or more trucks. Assuming the 80-acre farms to be but one-third of the total, this would mean the use of 2,120,500 trucks, whereas actually not more than 78,000 are now assisting the farmer to market more food, in better condition and at lower costs.

Unwise Truck Legislation Harmful to Public Interest

Many legislators have voted for legislation inimical to the motor truck from a feeling that they thus served the interests of the farmer. No error could be greater. The motor truck offers a haulage economy. It performs its function more cheaply than the horse-drawn vehicle.

In reality the haulage of farm produce by motor truck is cheaper than haulage by team.

This statement has the support of the Department of Agriculture. The 1918 figures of the Bureau of Crop Estimates show the cost of hauling in wagons per ton-mile as compared with motor truck haulage to be as follows:

	Wagon	Truck
Wheat	$.30	$.15
Corn	.33	.15
Cotton	.48	.18

Motor truck hauls from farm to shipping point averaged 11.5 mi., while wagon hauls averaged 9 mi. Motor trucks made 3.4 round trips per day, while wagons made 1.2 round trips.

So valuable have been the results obtained from the movement of food over the highways by motor truck that the State of Maryland has delegated authority to its Director of Farm Products to maintain and operate motor lines along the state highways to and from markets, and to maintain a service to and from terminals, docks, and depots for the collection and distribution of farm products. New York State is investigating this subject. The Nebraska State Railway Commission has recognized truck haulage and established a price rating on 100 kinds of articles.*

Some extraordinary economies have been achieved. Milwaukee gets its milk by trucks, over concrete roads, at a freight saving of 2 ct. per quart, which means a saving of $1,000,000 yearly to the people of that city.†

Trucks haul the Maryland peach crop to the packing plant where the product is loaded into waiting refrigerator cars.§ They thus act as a profitable feeder to the railroad spur, on which the packing plant is located.

The movement is also spreading rapidly to livestock shipment.

In 1919 there were received in Indianapolis, by motor truck, from nearby points more hogs than arrived by rail. For the year, more than 711,000 hogs, 48,000 cattle, 63,000 calves and 59,000 sheep arrived by gasoline truck in far better physical condition and at a material saving over railway freight cost.

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*See "Truck Express Rates Fixed in Nebraska," "Good Roads," Aug. 6, 1919, p. 83, and "Rates for Cross Country Trucking," by Thorne Brown, "Good Roads," June 16, 1920, p. 307.

†See "Cheaper Milk by Motor Truck," "Good Roads," Feb. 22, 1919, p. 90.

§See "Trucks Haul Maryland Peaches," "Good Roads," Oct. 1, 1919, p. 167.

Not only is food production stimulated by highway transportation from the farms, but mention should properly be made of the help rendered by motor trucks to plants which mill, preserve, produce, refine, refrigerate, retail and store various food products. These are vitally related to the great general scheme of production and distribution.

Insurance Against Railroad Strikes

A properly organized system of food transportation over the highways constitutes a national insurance against the results of railroad strikes. It means that the people are not dependent on one kind of transportation for the necessities of life. Railroad strikes will be fewer and their effects will be less distressing if we can turn to an alternative kind of food distribution.

In such emergencies the truck is always called on, even in its present state of only partial application. It was so in England during the railway strike, when all the food for London was successfully carried in motor vehicles. It was so in our own recent switchmen's strike. It will be so in future upheavals.

Why not, therefore, organize in advance for such contingencies, so that the vehicle of the highway may ever be swiftly ready to protect the health and life of the community during the continuance of labor disputes?

Motor truck facilities are equally valuable as applied to the transportation of fuels.

It is true that the distance transportation of coal and oil is essentially a railroad function in specially built cars, but in many stages of fuel distribution the highways play a most important part.

The great oil refining companies are without exception very considerable users of motor trucks.

Experience in the oil fields shows that expense is negligible where instant service is desired. The oil well is capricious and autocratic. It does not consider the convenience of its owner. It does not considerately manifest itself near railroad tracks. It is likely to gush from the earth at most inaccessible points.

When the oil operator strikes a gusher he must speedily get his equipment placed or suffer loss. He buys motor trucks, and—if need be—depreciates them at 100% on the particular job, being well able to do this if he can save time.

Many coal mines in this country have no railroad sidings. Coal and mine supplies must be moved by vehicle, and in many cases the motor truck has been 'opted.

Retail coal distribution is very largely a motor truck function, and it is thus possible to serve many manufacturing plants not directly located on railroad spurs.

Transports All Kinds of Raw Materials

Motor trucks are being applied in the transport of all kinds of raw material. They are used in mining copper, graphite, gold, lead, manganese, mercury, phosphate, salt, silver, sulphur and zinc.

Building materials such as gravel, leather, lumber, cement and sand are all very largely handled and distributed by trucks. Immense lumber sections in the Northwest, which otherwise could not be tapped, are being reached by trucks.

Opportunities frequently arise in the cotton industry for using trucks to transmit the raw material from the fields to the gins, from the gins to the trains, and the bales from the railroads to mills.

The whole record of production of war supplies is filled with instances where trucks brought in raw material and kept going plants that otherwise would have idled. One instance will suffice.

The American Woolen Company, largest of its kind in the world, depended on a Boston trucking firm which delivered at its mills 12,000,000 lb. of raw wool in one year. This material went into the making of uniform cloth for the American Army.

But it is especially in its relation to manufactured articles that the motor truck justifies itself as an adjunct to production. It discharges many functions. Its service begins when a building from which will issue production is being erected. It hauls away the dirt from the excavation, brings in materials for construction, delivers the raw material, and finally completes its record by carrying finished articles to the point of delivery.

Immense excavations such as those now in progress in Detroit have come exclusively to be a function of 5-ton dump trucks. Horse and cart have been eliminated as too hopelessly slow.

There is virtually not a single item of manufactured product that, in some stage of its transit from the point of fabrication to the place of final application or consumption, does not depend on the highways and motor trucks for rapid movement. To attempt to present even a limited record of the services so rendered would be to extend this presentation unduly.

Other lines of activity not directly connected with production, but intimately serving it, in which the truck has taken its dominating place include: Contractors, express, haulage and public utilities companies.

How All Interests Can Assist

If it be conceded that the highways may facilitate distribution and increase production, I should like to suggest to the gentlemen of this convention three main ways by which they may assist:

First, we ask that you assist in allotting to railroads and motor trucks their proper kind of haulage, so that each unit may discharge its true function in transportation.

Second, your help is solicited to protect the motor truck against excessive taxation and unfair, ill-advised and restrictive legislation. Forty-five legislatures will meet next year. They will consider at least 3,200 motor vehicle bills. Business men should help law makers to realize that the motor vehicle is

(Continued on page 20)

The Importance of Keeping a Traffic Census*

By W. A. McLEAN†

Roads should be built for the traffic they are to carry. This is an axiom of road building which cannot be too strongly emphasized, but which by many road authorities has been met in a hazy, experimental manner and without proper consideration of probable traffic; and the quality of wearing surface, its width, and the strength of foundation adapted to anticipated traffic. As a result, we find single track gravel roads where double track roads, or a concrete pavement should have been built; and conversely, asphaltic pavements are rolling and disrupting in idleness where a good gravel roadway would better have served every purpose.

It follows, then, that adequate information as to traffic is desirable as a rational basis for designing the road or pavement which is to serve any given location; and as a basis of determining whether an expenditure of $1,000, $10,000 or $50,000 for any given work, would be justifiable.

Meaning of Traffic Census

What is a traffic census? On the parallel of a census of population it might mean a complete summation of traffic passing over all the highways of a county within a lengthy period, including the number of vehicles, passengers and amount of freight. Such data would no doubt be very useful, but so far as the writer is aware, a census of traffic on such a scale has not been attempted. The term usually signifies an enumeration of the number and kind of vehicles passing a given point on a highway in a limited period of time—a day or a week or a fortnight—and generally omits as unimportant, the night travel. The census may be limited to one highway, or may include a series of highways, and may be at regular or irregular intervals.

Limitations of Value

The value of traffic census has limitations which are at once evident. Thus, the amount of traffic which will pass over many roads after construction, may bear little relation to the traffic over the unimproved road. In such cases, it is the potential traffic of a district which should be considered, rather than existing traffic; but definite data, obtained from actual count, are of use in determining the probable traffic which the improved road will be called upon to carry. Thus, on the Toronto-Hamilton Highway, traffic amounted to from 300 to 700 vehicles at various points; but with the completion of the concrete pavement, these figures leaped to 2,500, between the hours of 7 a. m., and 7 p. m.

The potential traffic of a district, preceding the construction of a road, is a matter for careful estimate; just as probable traffic for an electric or steam railway may be based on the population and industries served. A somewhat interesting series of charts was published in the report of the Ontario Highway Department for 1915, a net result of which was to show that not less than 80% of the traffic of the province is carried by 20% of the highways; that 80% of the roads are but lightly traveled, and are such as can be adequately built with a single track of gravel or broken stone. Also, that few roads serving a purely rural population would be required to carry a maximum of traffic much in excess of an average of 200 vehicles a day. Traffic in excess of that amount, except adjacent to the largest cities, may usually be attributed to interurban influences.

	Single horse	Two horse	Light trucks or passenger cars	Motor trucks	Total
Single track gravel	40	15	20	—	75
Double track gravel	50	50	100	5	200
Water-bound macadam. (single track)	50	30	40	—	120
Water-bound macadam. (double track)	90	50	100	10	250
Double track gravel, oiled or tarred	175	75	400	10	660
Double track macadam, oiled or tarred	200	150	600	10	1,000
Macadam penetration, bituminous	200	300	1,000	50	1,550
Macadam foundation, bituminous concrete	200	400	2,300	100	3,000
Bituminous concrete on cement concrete foundation	200	400	4,200	200	5,000
Cement concrete	200	200	4,400	200	5,000

Application to Construction

Knowing the potential traffic of a district, the highway engineer turns to data of the carrying capacity of various types of road and pavement—a matter in which there is room for much diversity of result. For example, limestone gravel has less wearing capacity than a gravel from trap or granite. The foundation and subsoil have a decided bearing on the case. Roughly, and with scope for much modification, the wearing capacity of various materials, as used in Ontario, may be broadly gauged from the accompanying schedule.

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*Paper presented at the 7th annual convention of the Canadian Good Roads Association, Winnipeg, Man., June 1-3, 1920.

†Deputy Minister, Department of Public Highways, Province of Ontario, Canada.

Some Purposes of Census

Among the purposes which traffic census may serve are the following:

(1) To determine the traffic importance of one road as compared with another in the same system, and thus to differentiate between different roads as to community value. These data may be useful in laying out a system, especially with a view to granting government subsides.

(2) To determine the traffic value of the same road before and after improvement. Such information is useful in determining the economic value of highway improvement.

(3) To determine the increase of traffic on the same road during a period of, say, 5 years, by two different censuses. Such data are useful in anticipating future increase in highway travel.

(4) To determine character of traffic, whether farm, local between centers of population, or tourist, and thus to arrive at a fair distribution of cost.

(5) To determine respective percentages of horse-drawn, passenger car and motor truck traffic, and by comparing previous censuses to estimate future changes with a view to adjusting type of construction.

(6) To determine local gross tonnage passing over a fixed point for a period of 12 daylight hours, in conjunction with the speed at which this tonnage travels, useful data in determining:

(a) Amount of wear, including impact and displacement resistance sustained by a certain type of roadway, comparing this with maintenance charge per year.

(b) Whether such roadway is economically fitted to bear this gross tonnage.

(7) To determine the importance of various phases of traffic, and therefrom determine the loadings and speeds which should be permitted, viz., for purposes of traffic regulation.

Traffic Census in Ontario

The first census in Ontario was taken between Oct. 15 and Nov. 15, 1913, at 20 stations on representative county roads, a large number being now part of the provincial highway system. The count was taken for seven consecutive days from 7 a. m. to 7 p. m., and classification of vehicles was divided into: 1-horse, light; 1-horse, heavy; 2-horse, light; 2-horse, heavy; motor runabouts; touring cars; and motor trucks.

Enumerators were provided with a card for each day with columns for each 2-hour period; for each of the above classes of vehicle a space was provided. The method of recording was by making one tick for each vehicle. These ticks were added and checked by the inside staff of the department. The conditions of roads and weather were specified.

Owing to the choice of a period when traffic was particularly light, a minimum traffic census was thus obtained.

A second census was taken at the end of July and the beginning of August, 1914, at 210 stations on roads radiating from 21 cities, for 7 consecutive days, 7 a. m. to 7 p. m. The classification of vehicles was the same as in the first census, the conditions of road and weather being described. Additional information, bearing on local industries and peculiarities of traffic, was also secured.

Censuses for certain localities were taken in 1915, on Dundas St., just west of Islington; in 1917, on the Lake Shore Road, just east of Mimico; and in 1918, at several points on the Queenston-Grimsby Highway and Dundas St.

Some American Results

In Massachusetts, a traffic count has been made at three-year periods since 1909. The actual count is made for 14 hours a day (7 a. m. to 9 p. m.) for seven consecutive days in August and seven in October. The count is also made at night at a few important points so as to cover the whole 24 hours. The classification is divided into light and heavy horse-drawn vehicles, automobiles and light trucks, and heavy trucks.

The following is a table of assumed weights:

Runabouts	1.45 tons
Touring cars	2.23 tons
Trucks	6.25 tons
1-horse, light	0.36 tons
1-horse, heavy	1.12 tons
2 or more horse, light	0.54 tons
2 or more horse, heavy	2.46 tons

The result of the census shows the percentage of each class and the percentage that each class is of the total traffic.

Thus, in nine years the total average daily traffic on roads has increased 243% and the total motor traffic has increased 661%, while in six years the number of heavy trucks has increased 341%.

In Iowa an interesting census was made in 1917, by the Engineering Experimental Station of Iowa State College, from 7 to 10 days. Scales were set up covering one-half of the width of the road; a huge sign was put across the road and the driver of every car was halted and interrogated. This census enabled the state to ascertain:

(1) Total number of vehicles;

(2) Character of traffic, whether farm, interurban, or tourist;

(3) Percentages of horse-drawn and motor vehicles;

(4) Tonnage of traffic;

(5) Width and character of tires.

In 10 days in June, 1917, near Ames, Ia., on the Ames-Des Moines road there passed a total of 1,995 vehicles, of which 647 were farm traffic, 1,227 interurban, and 121 tourist. These vehicles carried 1,561 passengers, and weighed 4,919,456 lb., gross. Of the total number of vehicles, 1,752 were motor vehicles

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Refined Tar in Construction and Maintenance*

By ANDREW F. MACALLUM†

The construction of refined tar pavements is of comparatively recent occurrence in Canada. Before tar was brought to a certain consistency, ordinary tar pavements had been laid in several cities for a number of years, probably the first of these being in Hamilton, Ont. These old tar pavements, having the tar and stone mixed on boards, somewhat like the method used for the original concrete bases of asphalt pavements, were fairly satisfactory, but were uneven in their wearing qualities on account of the variations in the tar used. This variation in the quality and density of the tar caused holes to form where the tar became brittle and had been burnt and these places became apparent a year or two after construction, creating an excessive amount of maintenance on streets of comparatively heavy traffic.

A redeeming feature, however, in these old tar pavements was that they made, in most cases, an excellent base for surfacing with asphalt or other topping after they had ceased to have a comparatively smooth surface.

The refining of tar for road purposes began about 1902 and quickly developed into an extensive industry subject to scientific control.

The tars available are roughly classified into coal tars and water gas tars, which differ essentially in physical and chemical characteristics and the resultant road tars made from them show similar variations.

On account of water gas tar having to be modified with other bitumens to make a suitable road tar, most of the road tars are made from coal tars. The crude tars are refined for road tars by dehydration, blending and distilling. The tars from different gas works, after settling, vary greatly in their contained percentage of water and this percentage varies from 2% to 10%. Different tars of known qualities are then blended or mixed to get a uniform product or a product fulfilling some definite specification and this blending requires an absolute knowledge of the diffierent tars used and of their action in distillation. In distilling, the water and light oils are first driven off, next the carbolic oils come over and finally the heavy oils. For light road oil, distillation is early stopped and for binder purposes the distillation is carried further.

Refined tars have recently become more or less standardized, and specifications often call for very similar materials for the different classes of work. The points now generally covered in a specification are the specific gravity, viscosity, or smelting point, free carbon and distillation. The vicosity or melting point is a very important point in refined tars and should be very carefully specified. It is customary to specify the viscosity for cold applications by the viscosity at 60°C and for hot surface application at 100°C.

Free carbon is usually specified not to exceed 10% of the weight of the tar. A small percentage of free carbon is beneficial, as resisting changes in temperature and changes in atmospheric conditions. On the other hand, an excess amount of free carbon tends to make the material difficult to work, reduces the amount of true bitumen, as it is an inert substance having no binding qualities, and reduces in cold surfacing materials the amount of penetration.

Specific gravity at 25°C., should not be less than 1.13 nor more than 1.25.

The success of simple surface treatments over water-bound macadam in resisting modern traffic has led to a reversion to the macadam type to meet the needs of roads of comparatively light traffic. The refined tars for cold application, having good penetrating power are valuable in treating bituminous macadam of every type. In the city of Ottawa we have 30 mi. of road treated with refined tar. Seventeen miles are on the Ottawa Improvement Commission's highway and 13 mi. are on residential streets in different parts of the city. The Improvement Commission, appointed by the Dominion Government, supervises the construction and maintenance of the roadways throughout the chain of parks. About 90% of this traffic is motor, the remainder being carriage, so that while there is comparatively heavy traffic there are very few heavy loaded vehicles with steel tires, except on some short sections.

The point where it becomes desirable, from an economic standpoint, to build a bituminous macadam instead of a plain macadam with a surface treatment, is not easy to determine, although theoretically the decision would rest on the ability of the road to resist internal wear.

A surface coating will protect the top if kept intact, but will not prevent wear within the road itself. If the loads on a macadam road increase beyond the ability of the structural strength of the road to bear them, the stones move on each other and internal disintegration takes place. If the stone used on the road happens to be soft, carrying heavy loaded vehicles will quickly wear the road from within, even though the surface is protected by treatment.

Any approach, then, to the point where this wear becomes a serious menace to the life of a road should indicate the advisability of introducing a bitumen into the structure of the road to prevent internal wear. On the Ottawa Improvement Commission highways

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*Paper presented at the 7th annual convention of the Canadian Good Roads Association, Winnipeg, Man., June 1-3, 1920.

†Commissioner of Public Works, Ottawa, Ont.

GOOD ROADS

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HAULING FOOD PRODUCTS OVER THE HIGHWAYS

In these days of concern over the farm situation it would be well if there were a better realization and understanding of the meaning of the folloing sentence from the paper, "Relation of Highway Transportation to Increased Production," which appears elsewhere in this issue.

"Over American highways pass a volume and value of food products of astounding dimensions."

While it is true that under present methods of marketing food products, the rail haul figures very largely in the transporting of farm products from the producer to the consumer, it is equally true that almost everything that is grown or raised for human consumption is carried, at some time, over the roads. It is also true that were our highway transportation facilities better developed an enormous volume of foodstuffs now wasted because of the difficulty or impossibility of getting it to market could be utilized and that the rail haul, in many cases, could be eliminated entirely.

The enormous wastage due to the producer's inability to market his produce at a reasonable cost is a matter of frequent comment. In the article to which reference has been made, the author quotes Herbert Hoover to the effect that this wastage amounts to 50% of the total of perishable farm products. Everyone at all familiar with conditions in producing sections has some personal knowledge of this waste.

The logical remedy for this condition is more efficient use of highway transportation—which means motor trucks and better roads. One of the great needs of agriculture today is a better highway system that will make the use of the motor truck feasible and economical, both in carrying produce from the farms to shipping points for long rail hauls and in bringing to city markets the produce from the surrounding producing areas.

MORE ANENT ENGINEERS' SALARIES

At the risk of being considered unduly insistent upon a single subject, attention is again directed to the inadequacy of the pay of those who build and care for the country's highways.

Elsewhere in this number appears a notice of a civil service examination for the position of highway engineer in the Bureau of Public Roads. This position carries a salary of from $2,100 to $2,700 a year, which in terms of weekly wage, is from a little over $40 to a little less than $52. A week ago attention was called to a similar notice of examinations for bridge engineers at from $25 to $52.

The requirements of the position are "at least six years of preliminary training in civil engineering, showing satisfactory advancement and indicating special fitness" together with "not less than five years' practical civil engineering experience subsequent to graduation (or to equivalent preliminary training), of which at least two years shall have been in the direction or performance of important highway engineering work." Completion of a four-year civil engineering course will serve in lieu of the six years of "preliminary training," as "each completed year of an engineering course in a college or university of recognized standing will be equivalent to not more than 18 months of preliminary experience." Additional credit is given for specialization in highway engineering in undergraduate work, for post-graduate work in highway engineering, and for "experience in the construction of concrete, brick, and bituminous types of surfaces."

A man especially qualified for this position would be one who had completed a four-year civil engineering course in which he "specialized in highway engineering"—thereby necessarily omitting some of the fundamental subjects he ought to have taken—had then completed two years of post-graduate work in highway engineering, and then had five years of actual work in highway engineering, during which he had had charge of the laying of high class pavements.

Is there any reason why a man with those qualifications should seek a job paying him $52 weekly?

Relation of Highway Transportation to Increased Production

(Continued from page 15)

an economic asset, so that there may be enacted only laws which are fair and beneficial to highway transportation and the general public.

Third, from a practical standpoint it is above all things vital that you aid us to establish an efficient system of highways under federal direction.

Right roads must be available 365 days of the year; this involves a system of snow removal. During the war there were organized snow removals under state and national direction. This work could well be continued now, especially in keeping open that 20% of roads on which 90% of highway traffic is concentrated.

Limit Truck Weights on Highway

The automobile industry recognizes the menace to the highways of excessively heavy trucks, and advocates that no vehicle weighing more than 28,000 lb., gross load, shall be permitted the use of the public roads, as at present constructed. It believes also that the increasing use of pneumatic tires on trucks will reduce the damage.

But we are equally convinced that the highways of the future should be the servant of transportation, not its master. They should be prepared to accommodate a constantly increasing volume of haulage carried by whatever size of truck shall prove most swift, efficient and economical.

(To be concluded)

The Importance of Keeping a Traffic Census

(Continued from page 17)

and bicycles, and 243 were horse-drawn. The exact basis of farm and interurban traffic was difficult to determine, but it was considered that farm traffic included traffic originating or terminating at the farm, or doing business in passsing, e. g. mail. Thus 32% was farm traffic, while 84% was local, i. e. between Ames and Des Moines.

Some American cities favor three enumerators at one station, one man to call out classification, the second to mark down the tick, and the third as relief man. This allows for a continuous count to be made in shifts, one man resting.

In the United Kingdom, methods may be illustrated by a traffic census on the roads radiating from Stirling, Scotland, taken in August and September, 1914, covering 16 hours a day, (6 a. m. to 10 p. m.) for 7 consecutive days.

An assumed average weight was given to each type of vehicle and, the width of carriageway being given, the total weight in tons per yard width was ascertained. This assumed weight differs very little from that used in the Massachusetts censuses.

In London, yearly censuses are taken on such thoroughfares as Fleet St. and Putney Bridge for 12 daylight hours on one day, and are chiefly used for determining the density of traffic rather than wear to pavement.

Traffic Regulation

Traffic regulation, it has been suggested, is a matter in which traffic data may be of service. "Build the road for the load" is advice commonly heard. As a phrase it has a sound that appeals. That is, they tell us not to limit the load, but to put an unlimited expenditure into the construction and maintenance of the road. If any unlimited load can destroy or injure a road, it is to be taken as evidence that the road, and the men who designed it, were at fault. In British Columbia a case was recently in the courts, in which damages were sought for the destruction of a concrete pavement. A lumberman had put a stick of timber weighing 40 tons on a truck, and had broken every slab of concrete pavement over which the load passed. This lumberman no doubt held the view that "the road should have been built for the load."

Truck owners in Ontario have told the speaker of instances in which their vehicles, carrying 10 to 12-ton loads, particularly in the early spring, have made ruts 4 to 6 in. deep, and 10 to 20 mi. long, in a single trip over a gravel or macadam road. This information has been imparted by the truck owner cheerfully, and evidently without realization of the thousands of dollars of injury which they have done to make $50 or less.

The attitude of the truck owner when considering a trip over the country roads is apt to be merely one of, "can we get through?" Damage to the road in so doing is a matter which has not been brought to his attention.

Light traffic is largely a question of durable surface, with sufficient foundation to resist minor, but frequent, strains of impact. Heavy truck traffic demands not only a durable surface, but a heavy foundation.

The maximum weight of load is an important factor, and one which must be determined before the highway engineer can reasonably be asked to design the roadway. Recent legislation in Ontario has limited the maximum weight to 12 tons, including load and vehicle, with 4½ tons on any wheel, and 650 lb. per inch of tire. During the months of March and April, the load for a motor truck is limited to one-half the carrying capacity of the rated vehicle.

Definite Data Needed

Highway design, as previously stated, is necessarily based on traffic. Traffic data and information as to the behavior of various details of design under different ranges of traffic are, therefore, necessary to scientific and rational design. Highway transportation is in a condition of flux, and an immense growth may be anticipated in the next decade. Much data of value in road design is now available, but engineers and road authorities can render this work a valuable service by assisting in the task of accumulating definite results, in order that "trial and error" methods may finally disappear from this important branch of public works.

Relation of Highway Transportation to Increased Production

(Continued from page 18)

mentioned above it has been found that a surface treatments is sufficient, as the stone used was comparatively hard, but where heavy loaded vehicles operated results were not so satisfactory. Two methods have been adopted of introducing the road tar —by mixing in a machine somewhat like asphalt or by penetration in pouring the refined tar directly on the roal metal. The mixed method is only used when a somewhat higher type of road is intended, but, as the penetration method is less expensive and easier to handle and requires less expert workmen, it is the method generally used.

The foundation for a tar macadam should be carefully prepared, drained either by side or under drains, and sometimes by both, according to the conditions met with; and as this applies to all road construction, it will not be considered further, except to mention that the rolled subgrade should have the cross-section of the finished surface. This crown should, however, be not greater than 3/8 in. to the foot.

Assuming a new roadway, there are two courses, the lower or base course, varying from 4 to 8 in., according to the nature of the foundation. The stone used is generally specified to pass a 3½-in. ring and remain on a 2¼-in. ring and this stone is spread evenly over the subgrade and rolled. This stone, if laid in greater layers than 4 in., will not compact properly under a road roller of 10 to 12 tons, and if a thicker course is required, it should be rolled in layers. Unless grade stakes are set and the rolling worked from the sides to the center it is rather difficult to get a correct contour of the surface.

After this base is solid, the voids between the stones should be filled with clean gravel, sand or stone screenings. This filling tightens up the base and prevents the refined tar from the upper course from running down into the base and draining away from where it is needed. After rolling, this base is ready for the upper or tarred course and this base should be 2½ in. below the proposed finished surface of the road. Where old macadam roads are to be treated the old surface is scarified, new stone added where necessary and rolled to the same grade, namely 2½ in. below the surface. The top or wearing course is now spread uniformly and unless this is done carefully there is the possibility of uneven wear. The stone for this course is usually from 1¼ to 2¼ in., the hardest stone if procurable being of the smaller size. It is very essential that this stone shall be clean and as free as possible from dust, clay or loam so that a good penetration may be secured. The stone must be carefully rolled to secure a firmly knit surface but should not be over rolled or have the angular points of the stone broken off and thus prevent the refined tar penetrating to the first course. This course, which is spread about 3 in. deep, will be compacted to a thickness of about 2½ in.

The refined tar, heated in the tank cars to a temperature of from 200 to 250° F, is carried in tank wagons and poured evenly over this wearing course, which will require about 1½ gal. per square yard. To apply this uniformly requires experience which, however, an intelligent workman can obtain in a few days. On small jobs, where it is difficult to operate tank cars and wagons, the refined tar is shipped in barrels, heated in open kettles and hand pouring pots are used to distribute the tar. After the tar has been poured the surface should have a uniform black appearance, with the upper spaces between the stones showing. These upper spaces are now filled up with ¾-in. stone, spread uniformly over the surface, but not in enough quantity to form a distinct layer. The surface is again rolled to force the stone into the voids and any excess of small stones should be swept off with push brooms so that the seal coat will adhere properly.

The seal coat, usually about ½ gal. to the square yard, is now put on uniformly in a manner similar to the previous coat and a coat of screenings or stone the size of peas is spread evenly and rolled, after which the road is ready for traffic.

A paper on refined tar pavements would not be complete without touching on maintenance. So long as the surface is intact, these pavements are very resistant to traffic, but where the surface is broken it spreads very quickly so that where breaks occur repairs should be made quickly. Any road without maintenance is sooner or later of little value to a community and an improved road soon drops back into the unimproved class if it be neglected. Some types of roads last longer than other types without attention but they are not for that reason always the most desirable and it is just as well to remember that there is no such thing as a permanent road.

As a rule, a community gets the most economic value out of a large mileage of reasonable cost roads that can be cheaply maintained, rather than out of a short mileage of high cost roads of the heavy city street type, providing these cheaper roads are built up to the traffic they have to carry.

During this time of tourist prices it is with some diffidence that I give figures showing the maintenance cost of refined tar pavements, as they are apt to be a little more misleading than usual. In Cambridge, Mass., previous to 1915, the cost of the upkeep on refined tar pavements averaged 2 ct. per square yard. In Ottawa the cost per square yard was 3 ct. for the last year.

In the eastern states, on roads having the usual state road travel between towns, I find that one road down for two years cost $12.50 per mile, another down five years, $67.10 per mile and two roads down for six years cost $184.00 and $258.00 per mile, respectively, all of these roads being about 20 ft. in width. The secret of low cost in repairs and maintenance is to keep the surface intact at all times.

In conclusion I wish to say that as road engineering has now become a special branch of engineering, it is the wisest business policy for a community to engage someone who knows and has the required technical skill. An engineer must know not only how to build the higher types of road but must be conversant with the building of all types from the gumbo up. The choice of any particular type of road surface can be determined only by a thorough study of the governing factors and the cost of the improvement should always be linked with the cost of upkeep. Every district has its own problem but it is best solved by a thorough study of the work done by other communities with somewhat similar conditions but with larger experience.

Highway Legislation in New York

Summary of Laws Relating to the Building, Maintenance and Use of Roads Passed by the State Legislature at This Year's Session

The appropriation laws approved by Governor Smith for highway work aggregated more than for any year since the entrance of this country into the World War. In all there were introduced during the 1920 session more than 90 bills amending the highway law and appropriating money for highway work. As is usual, many of these bills were killed.

Among the bills which failed to pass was the one providing for snow removal on the main trunk highways so as to maintain motor traffic between the principal cities during the winter. Another bill which proposed to beautify the roads of the state along the lines of the so-called French system, also failed. Many of the measures introduced have been reported in previous issues of GOOD ROADS. [See note on bill to acquire toll bridges, Mar. 3, p. 130; note on maintenance appropriation bill, Mar. 3, p. 132; "Highway Legislation in New York," Mar. 17, p. 150: "New York's Road Maintenance and Repair Appropriation," Mar. 31, p. 174; "New York Appropriations," May 5, p. 234; note on law regulating size and weight of motor trucks, May 5, p. 240; "New Motor Vehicle Laws of New York," May 19, p. 260; "New York Passes Engineer's Licensing Law," June 2, p. 281; note on Gov. Smith's signing the Walters Bill, June 9, p. 290.—Ed.] Brief summaries of the more important measures, in addition to those already reported, which were enacted into law, follow:

Chapter 670 appropriates $10,000,000, payable out of moneys realized from the sale of bonds issued in accordance with the provisions of Chapter 298, Laws of 1912, for highway improvement. Senate Print 1850.

Chapter 669 appropriates $261,359.79 for the construction of state and county highways in accordance with Chapter 400, Laws of 1915. Assembly Print 939.

Chapter 301 appropriates $90,000 for construction of the Bradford-Carrollton Highway.

Chapter 661 appropriates $255,937.84 for the improvement of highways in Lewis County, that sum being the unexpended balance of Lewis County's share of fund for highway improvement.

Chapter 801 appropriates $3,450,000 to pay excess cost of completion of work embraced in war contracts and for reimbursing counties for highway construction.

Chapter 42 appropriates $2,302,000 for repair and improvements of town highways, of highways and bridges in Indian reservations and of county roads.

Chapter, 154 appropriates $3,750,000 as the state's share of improving and constructing rural post roads. Senate Print 919.

Chapter 147 appropriates $300,000 for the payment, in the first instance, of the Federal Government's share of constructing federal aid roads. Assembly Print 907.

Chapter 80 appropriates $7,500,000 for the maintenance and repair of improved state and county highways. Senate Print 597.

Chapter 892 appropriates an additional $1,000,000 to be used in carrying on the work of the New York State Bridge and Tunnel Commission in connection with the New York-New Jersey vehicular tunnel. Senate Print 2182.

Chapter 560 provides that the State Highway Commission may proceed with improvement of alignment and dangerous sections of highways. Senate Print 1384.

Chapter 189 prohibits the use of motor trucks and trailers on the highways, outside of cities, having a width of more than 8 ft., a height of more than 12 ft. 6 in. and a combined load of more than 25,000 lb. Senate Print 184.

Chapter 562 regulates the awarding of contracts by towns and counties and payments to contractors. Roads constructed in towns under the provisions of this section (131) must be maintained with an annual expenditure of not less than $100 per mi. Senate Print 1966.

Chapter 559 changes the fiscal year of reports of highway departments of towns and counties from Nov. 15 to Jan. 1. Senate Print 1536.

Chapter 557 requires that the county superintendent must file certificates of the closing of a road for repairs with the town clerk and the division engineer and also provide adequate detour signs and lights to divert traffic. Senate Print 1359.

Chapter 841 provides for the construction of highways by towns and counties in that resolutions for collection of taxes may provide that the money may be expended under the direction of the town superintendent or the county superintendent as the board of supervisors may deem best. Assembly Print 1993.

Chapter 840 provides that the state shall pay annually to the several counties for construction and improvement of highways other than county highways an amount equal to the amount therein levied, no county to receive more than $30 per mi. for the total mileage outside of cities and incorporated villages. Senate Print 1295.

Chapter 558 adds a new section which permits the change of location or abandonment of highways over lands owned and occupied by the state. Senate Print 1646.

Chapter 684 provides that motor vehicles must be equipped with proper lights conforming with the requirements of law before being registered. Senate Print 902.

Chapter 695 permits the operation of motor vehicles for carrying children to and from school outside a city without an omnibus license. Senate Print 725.

Chapter 686 permits a person to operate a motor vehicle to carry children to and from school without requiring from him a chauffer's license. Senate Print 726.

Chapter 683 increases from $2 to $10 the fee for number plates for omnibuses. Senate Print 416.

Chapter 561 permits the construction and maintenance of highways and walks upon islands with state aid. Senate Print 121.

Chapter 371 raises the compensation of town highway superintendent to not less than $4 nor more than $7 per day. Previously the compensation of town highway superintendent was not less than $2 and not more than $5 per day. Senate Print 416.

Chapter 871 amends section 320-a relative to county aid for construction, improvement and maintenance of town highways by providing that the board of supervisors may authorize the construction of town highways under the direction of the county superintendent of highways. Assembly Print 2215.

Chapter 221 provides that 50% of cost of land acquired for right of way and other purposes in a county of more than 300,000 population adjoining New York City shall be borne by towns or cities in such county in which the lands are located.

Chapter 313 provides that the total cost of constructing federal aid highways other than those on state routes, shall be apportioned 35% to the state and 30% to the county. Senate Print 429.

Chapter 158 authorizes managers of state institutions to adopt rules limiting speed of motor vehicles on grounds of institution to not more than 15 mi. per hour.

Chapter 246 authorizes the taking over of a toll bridge at any time after judgment shall be entered in condemnation proceedings and provides that such bridge shall be maintained as a free bridge and part of the state highway system.

Chapter 279 authorizes Jefferson County supervisors to expend annually such sum as they deem necessary for removing snow from highways of the county.

Additional bills to those already noted introduced during the 1920 session but which failed to become enacted into law include the following:

No. 1383, introduced in the Senate by Mr. Hewitt, authorized the State Commission of Highways to purchase materials to be used in the construction of highways.

No. 1287, introduced in the Assembly by Mr. Gardener, would make the throwing of refuse on public highways a misdemeanor.

No. 1887, introduced in the Assembly by Mr. Everett, would prohibit the use of sleighs having runners less than 56 in. apart.

No. 354, introduced in the Senate by Mr. Hewitt, provided for the appropriation of $104,000 for improvement of state highway No. 20 within the villages of Clyde and Newark.

No. 1455, introduced by Mr. Towner in the Senate, provided that the State Commission of Highways should furnish engineers and equipment to the several counties for the removal of snow from state and county roads.

Examination for Highway Engineer in Bureau of Public Roads

For the purpose of filling vacancies in positions of highway engineer in the Bureau of Public Roads, an open competitive examination is announced by the United States Civil Service Commission. Competitors will not be required to report for examination at any place but will be rated upon sworn statements in their applications and upon corrobative evidence.

Applicants must have had six years of preliminary experience in civil engineering, each completed year of an engineering course in college to be counted as 18 months' experience. Additional credit will be given to those who specialized in highway engineering in their undergraduate work. Besides the preliminary training, applicants must have had at least five years' practical civil engineering experience, of which at least two years must have been in highway engineering. Additional credit will be given for postgraduate work in highway engineering and also for experience in the construction of concrete, brick and bituminous types of pavements.

Applications may be sent to the Civil Service Commission until Sept. 9, 1920. Engineers desiring to apply should send for Form 1312, stating the title of the examination. Applicants should not be over 35 years of age. The position of highway engineer pays from $2,100 to $2,700, entrance salary, and promotions to senior highway engineer are made from this grade.

San Diego County, California, Has Extensive Highway Program

Bids were recently opened by the supervisors of San Diego County, California, for the construction of four sections of paved road under the recent $2,300,000 bond issue, a total of 30.87 mi. being included in the bids. Surveys of 110.13 mi. of the total 128.92 mi. embraced in the program have been completed and contracts have already been let for the grading of several sections.

Pennsylvania to Issue Short Term Bonds

The sale of $18,000,000 of road bonds has been postponed by Pennsylvania and $12,000,000 short term bonds, maturing in about three years and bearing 4½% interest will be issued. It is reported that a syndicate of bankers in Pittsburgh and Philadelphia has agreed to buy the short term bonds at par.

The $18,000,000 worth of bonds, the sale of which has been postponed, is a part of the $50,000,000 road bond loan, of which the state sold $12,000,000 last year, purchasing $1,500,000 for the sinking fund.

Paving Ordinance Held Invalid

The Court of Errors and Appeals, Trenton, N. J., on June 18 declared invalid an ordinance of the Beverly City Commission appropriating $50,000 for the curbing and paving of streets. The suit was started by Garret D. Logan, a taxpayer, who complained that the city commissioners ignored a remonstrance filed against the ordinance when proposed and refused to give it a public hearing. The decision, which affirmed the decision of the Supreme Court in the case, held that under the Home Rule Act, the passage of an ordinance under such circumstances is null and void.

Advisory Highway Board Named by Secretary of Agriculture

The Secretary of Agriculture has appointed an advisory highway board which will endeavor to lay the plans for the national development of highways. Meetings will be held and the policy adopted in spending federal aid funds under direction of the Bureau of Public Roads will result from recommendations of this board. Members appointed to the board are as follows:

Paul D. Sargent, Chief Engineer, State Highway Commission, of Maine; Joseph H. Pratt, Secretary, American Association of State Highway Officials; George E. Johnson, State Highway Engineer, of Nebraska; W. G. Thompson, State Highway Engineer of New Jersey; Ira R. Browning, State Road Engineer of Utah; W. D. Uhler, Chief Engineer, Pennsylvania State Highway Commission; C. J. Bennett, State Highway Commissioner of Connecticut; A. B. Fletcher, State Highway Engineer of California; W. R. Neel, State Highway Engineer of Georgia; W. S. Keller, State Highway Engineer of Alabama; Geo. P. Coleman, State Highway Commissioner of Virginia; S. E. Bradt, Superintendent of Highways, Illinois.

Philadelphia's Highway Work

The highway program of Philadelphia, Pa., provides for the grading of 28 streets, covering 58 blocks, a total distance of approximately 5 mi., together with the construction of 135 blocks with a mileage of about 11.3 mi. Reconstruction work will cover 91 blocks or about 7.5 mi. Contracts amounting to more than $3,500,000 have been awarded by the street department.

New Highway Officials in New Jersey

Governor Edwards of New Jersey on June 29 removed the members of the State Highway Commission, naming a new board in its stead, thus fulfilling one of his campaign promises.

The men named for the board are as follows:

David Young of Morris County, Walter F. Whittemore of Sussex County, Thomas E. Collins, of Union County, John Ferris of Hudson County, William T. Kirby of Somerset County and George L. Burton of Middlesex County. The eighth member has not yet been named.

The commission organized by electing Mr. Burton chairman. Thomas J. Wasser, County Engineer of Hudson County, was named state highway engineer to succeed W. G. Thompson, whose resignation has been noted, and A. Lee Grover was reappointed secretary.

Gore Pass Road in Colorado to Be Improved for Motor Traffic

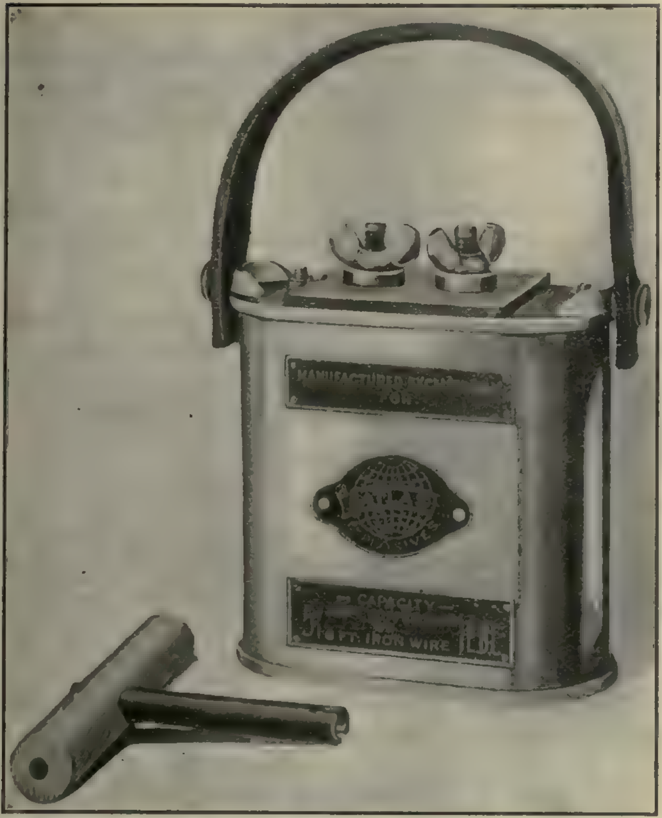
Gore Pass Road, probably the oldest wagon route across the Continental Divide, in Colorado, but over which no motor vehicle has yet been reported to have passed, will soon be opened to motor traffic. The State of Colorado and Routt County have appropriated $10,000 each for the improvement of the road, which connects Toponas in the southern end of Egeria Park with Kremmling in Middle Park.

Gore Pass Road was first crossed with wagons in 1856, when Sir George Gore, an Irish nobleman, with an army of servants and retainers, penetrated the wilderness beyond the pass in search of game. In the same year Gen. Bela M. Hughes, pioneer stage manager, opened a route between Denver and Salt Lake City over Gore Pass, taking advantage of the work already done by Sir George's men. A stage company was chartered to operate between the two cities but the stages were never run.

EQUIPMENT—TRADE—MATERIALS

New Light Weight Blaster

A new blasting machine weighing but 3¼ lb. and known as the Davis No. 1 blaster, has been placed upon the market by the Atlas Powder Co. Enough current to fire five 30-ft. copper wire or five 6-ft. iron wire electric blasting caps in single series is generated by the machine.



NEW DAVIS LIGHT WEIGHT BLASTER

The outer case of the machine is a seamless brass tube, 2x4x4½-in., heavily nickeled, with aluminum top and bottom plates. A removable leather strap is provided for carrying purposes. The machine is operated by inserting the key, shown in the accompanying illustration, in one slot in the bottom of the blaster and twisting to the right as far as possible.

Missouri Uses Tractors in Road Building

Tractors play a more and more conspicuous part in road construction, being able to stand up under heavy loads and unfavorable tractive conditions much better than can horses and mules.

Because of the increased road building activity and also because road builders are demanding better designed labor saving machinery, many manufacturers are building tractors especially designed for road work. The accompanying illustration shows the Lauson Full Jewel kerosene tractor engaged in construction work on the highways near Kansas City Mo.

LAUSON TRACTOR ON MISSOURI ROAD WORK

This tractor has heavy cast rear drive wheels which give the necessary traction and prevent slipping on loose dirt roads. All the gears are enclosed and run in a bath of oil, being well protected from dust and dirt.

The Portland Cement Association has issued two new booklets treating on the "Maintainance of Concrete Pavements" and the "Curing of Concrete Pavements Laid in Hot Weather." Both booklets are thorough in their discussion of practices based upon the latest knowledge of concrete, containing illustrations and charts which add to the clarity of the exposition.

The city of Chattanooga, Tenn. has purchased an 800-gal. Kinney auto heater and distributor and a 1000-gal. tank with bronze lined pump, flusher nozzles and sprinkler heads. It is the intention of the city officials to use the oiler equipment, which is interchangeable with the flushing equipment, for three or four months in the summer and to use the flusher mounted on the same chassis at other times. The combined equipment cost $11,000.

———ooo———

Citizens of Grand Forks, N. D., are planning to organize a good roads association.

The Pennsylvania State Highway Department has announced that a total of 2,266 dealers in second-hand automobiles have taken out licenses this year and that the receipts from this source amount to $160,250.

MEETINGS

Calendar of Coming Meetings

Aug. 10-12.—American Society of Civil Engineers.—Fiftieth annual convention, Portland, Ore. Secretary, Charles Warren Hunt, 29 West 39th St., New York, N. Y.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Pennsylvania State Association of Boroughs

The annual convention of the Pennsylvania State Association of Boroughs was held June 22 to 25 at Stroudsburg, Pa. An exhibition of road building materials, fire apparatus and other equipment was held in connection with the meeting and was featured by a demonstration of laying street pavements.

C. L. Edinger, Burgess of Stroudburg, formally opened the sessions and T. F, Chrostwaite. President of the association, responded. Among the subjects taken under consideration was that of constitutional revision as it effects boroughs. Other topics discussed dealt with municipal home rule, public utilities and the attitude of boroughs toward them, taxation, finance and methods of assessment.

New York State Conference of Mayors

The eleventh annual meeting of the New York State Conference of Mayors and Other City Officials, together with the thirteenth annual meeting of the New York State City Clerks' Association and special conferences for city health officers and city engineers, were held at Jamestown, N. Y., on Tuesday, Wednesday and Thursday, July 6, 7 and 8.

The meeting opened on Tuesday forenoon with a joint session at which Mayor Samuel A. Carlson, of Jamestown, made the welcoming address and responses were made by Mayor Walter R. Stone, of Syracuse, President of the Conference, and City Clerk Daniel J. Sweeney, of Buffalo, President of the City Clerks' Association.

At a special conference for city engineers on Tuesday afternoon, Frederick S. Greene, State Commissioner of Highways of New York, was one of the speakers. He presented a paper on "Street Paving Construction," which was followed by a general discussion.

Officers for the coming year were elected as follows: President Wm. J. Wallin, Mayor of Yonkers; Vice President, Ralph R. Butts, Mayor of Poughkeepsie; Treasurer, James R. Watt, Mayor of Albany; Secretary, Wm. P. Capes.

PERSONAL MENTION

R. Stevenson has been appointed county engineer of Schleicher County, Texas.

C. C. Braden, formerly on the teaching staff of the A. & M. College of Texas, is now engaged in road work for Polk County, Texas.

B. R. Avent is now engaged in engineering work for Polk County, Texas, coming from the teaching staff of the A. & M. College of Texas.

Thomas S. Scott, Professor of Civil Engineering at Queen's University, Canada, has resigned to undertake road construction at Brockville, Ontario, Can.

Romeo Morrissette has resigned his position with the Department of Public Works, Canada, and is now with the National Shipbuilding Corporation, Three Rivers, P. Q.

Roy M. Green has resigned as professor of highway engineering at the Agricultural and Mechanical College of Texas and is now president and manager of the Western Laboratories, Lincoln, Neb.

A. T. Laing, in charge of the course in highway engineering at the University of Toronto, Canada, has been retained by the Department of Highways of Ontario to make a special investigation of motor vehicle headlights in connection with the new non-glare law of that province.

———ooo———

The Roads of South Dakota are in very poor condition, because of rains, according to a recent report.

The State of Nebraska has purchased 63 acres of gravel land situated along the Platte River north of Ashland at a cost of $18,000. It is estimated that gravel for road construction will be secured at low cost.

A Bill Introduced in the Texas Legislature recently provides that the State Highway Department shall institute inquiry into the production of cement in the state, especially as to its cost and adequacy to meet construction requirements. The bill states that highway work is being delayed because of the high price of cement.

Schuylkill County, Pennsylvania, has offered for sale a bond issue of $700,000, the proceeds to be used in building county roads connecting with the state roads in the county. A million and one half dollars are being expended on the state roads in the county and it is hoped that roads constructed with these bonds, which bear 5% interest, will be completed at about the same time as are the state roads.

GOOD ROADS

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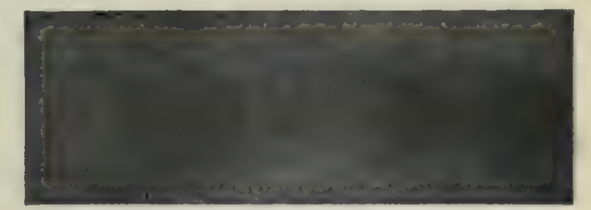

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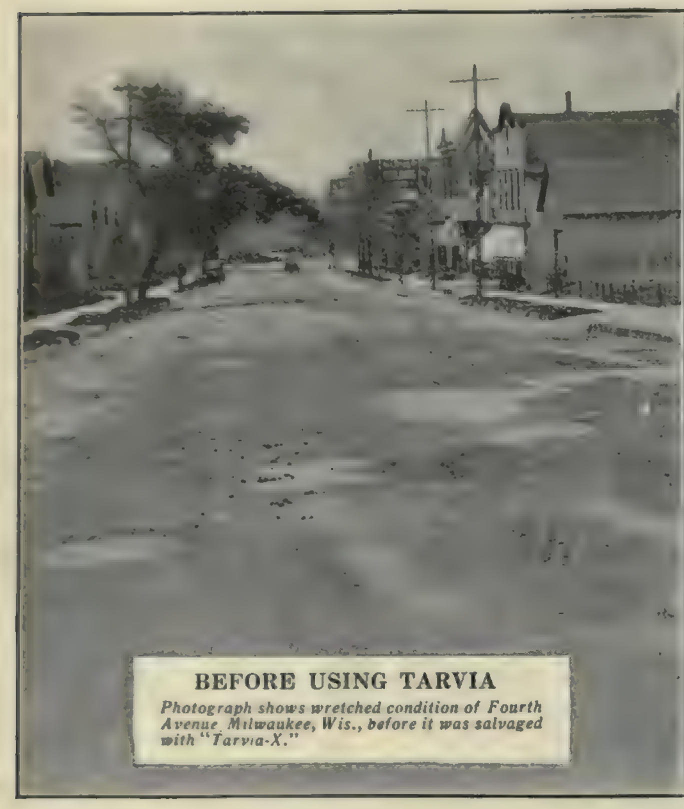
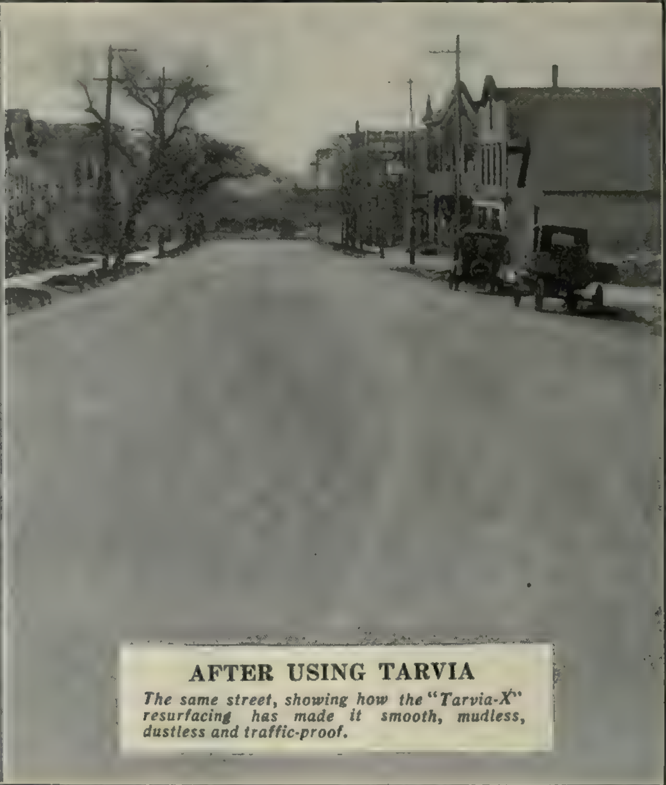


BEFORE USING TARVIA

Photograph shows wretched condition of Fourth Avenue, Milwaukee, Wis., before it was salvaged with "Tarvia-X."



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GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE
WITH WHICH IS INCORPORATED
THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
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JAMESTOWN, N. Y., JULY 21, 1920
Number 3

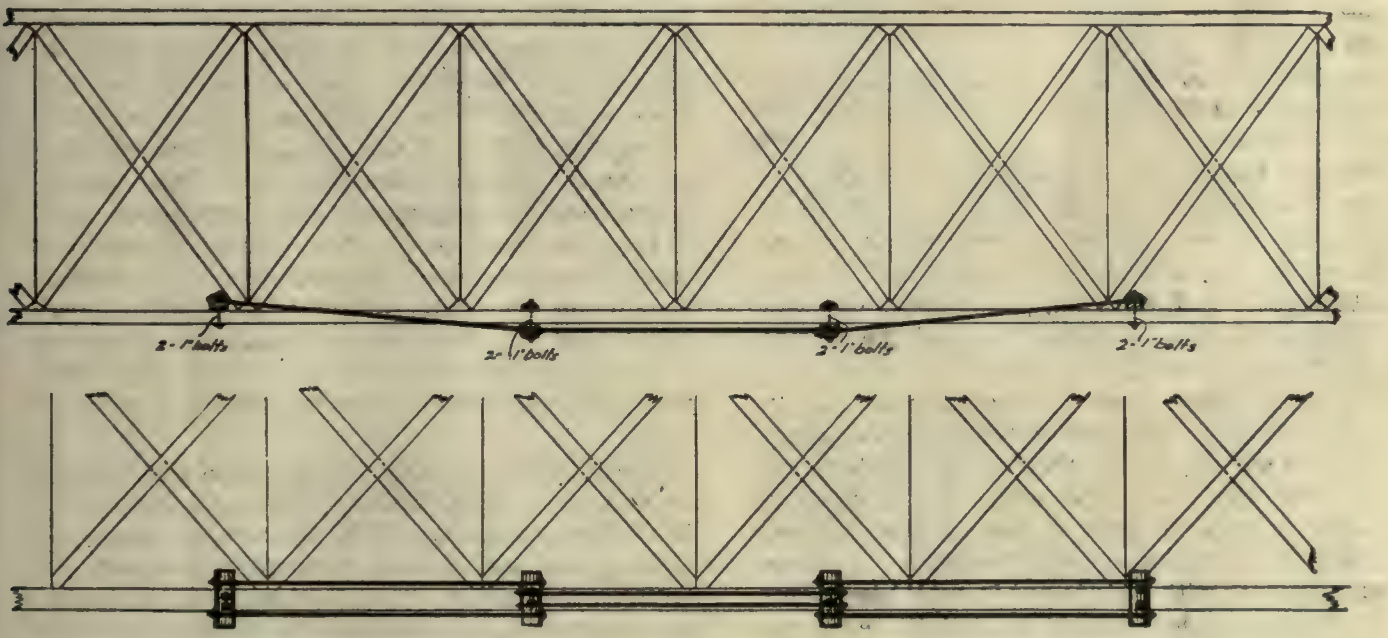
Methods of Repairing Timber Bridges in British Columbia*

By T. KILPATRICK†

From an economical standpoint the filling of small bridges and some of the approaches to the large ones is an important subject and perhaps does not get the attention that it merits. One of the factors against the more general adoption in some districts appears to be the uncertainty existing as to whether it should be charged to the road or bridge vote. This is a question that should be more clearly defined. In other instances it is due to the long haul for the filling material. This can be overcome by the more general use of trucks and tractors.

During the year the cost of timber has increased enormously and much more in proportion that the increase in filling and concrete. For instance the average cost of flooring is $50 per M., in place. This means, for a 16-ft. floor and 3-in. plank, a cost of $2.40 per lin. ft. of bridge, and for a 4-in. plank, $3.20 per lin. ft. of bridge. This larger amount will fill a bridge 5 ft. high at 64 ct. per cu. yd. for filling. This applies particulalrly to approaches where no waterway is required. A standard 16-ft. high timber trestle at $50 per M will cost $10.80 per lin. ft. This will allow 41 ct. per yd. for filling. This, under favorable conditions, should be sufficient.

For the same reason concrete culverts, arches, abutments with reinforced concrete stringers for the shorter spans and concrete piers for the larger ones, can comparatively be more economically built now than ever before.



METHOD OF TEMPORARILY SUPPORTING BOTTOM CHORD WITH RODS—SEE (1)—TOP VIEW IS SIDE ELEVATION, LOWER VIEW SHOWS UNDER SIDE OF CHORD.

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*Paper presented at a convention of Provincial District Engineers.

†Provincial Bridge Inspector.

In most districts the renewals and repairs of bridges are done in a good workman-like and economical manner, but in some districts the work is delayed. Some say this delay is due to the difficulty of getting competent foremen and workmen; others to the delay caused by the appropriations being passed late in the season, preventing them from getting the necessary material delivered at the different structures and the work done during favorable weather.

The appropriations should be applied for and granted as early in the fiscal year as possible. This will enable the men in charge of the work to have the necessary material all distributed at the different structures. If this is done it will save delay which means additional cost.

Before passing this subject I wish to again call your attention to the importance of giving special attention to the tightening of rods and bolts the first and second summer after the erection of all trusses. None but competent truss framers should be allowed to do this work.

Some action should be taken to cut and clear away all brush and old timber from all bridges to the full width of the roadway.

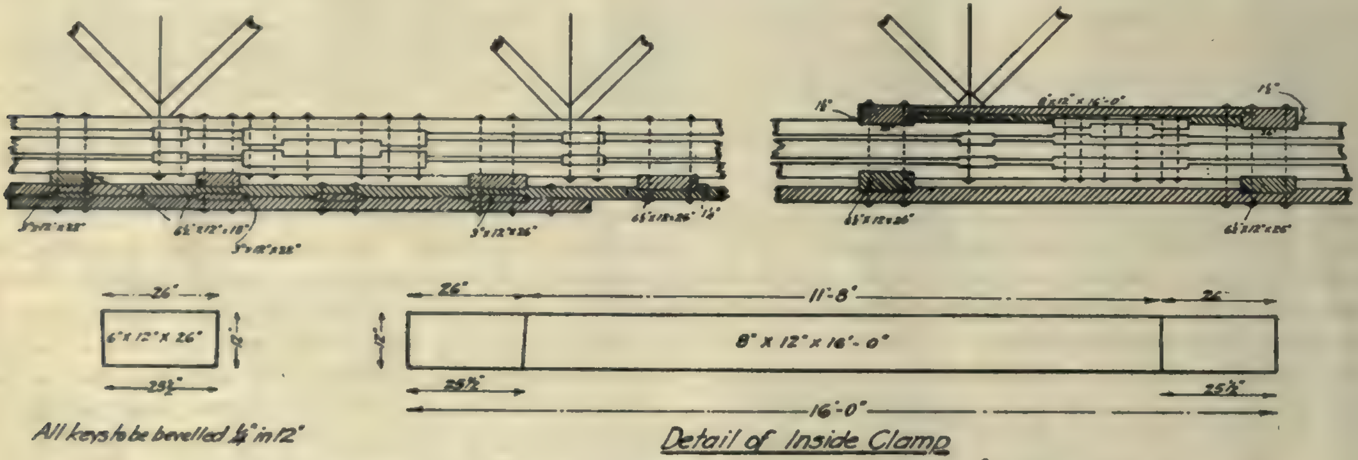
Recent Partial Failures of Bottom Chords

Columbia River at Revelstoke (six 150-ft. H. T. spans).—Early last spring the downstream bottom chord of the two end spans parted. In the west span the center leaf, 8x12 in., pulled apart ½ in. in the third panel from the shore end and the outside and inside leaves sheared or crushed an equal distance at their joints at each end of this break. In the east end span, both the center and outside leaf joints were severed in the third panel. Both these breaks were supported temporarily with three sets of two old truss rods each, and timber and piles ordered immediately to put on reinforcing leaves on these chords, together with piles to put in extra piers. This chord reinforcing has been done and the east end span three panels with double bent pile piers.

One of the causes of the failure of these end spans was the design. The shore ends are nearly 7 ft. less than the standard vertical height and no difference was made in the length of the panels. Consequently the braces at the shore ends have a much less vertical angle, so producing much greater tensile strains on the bottom chords which resulted in the break occuring at about one-third of the length of the span from the low end and not at the center where the break usually accurs when the upper and lower chords are parallel. During the summer, breaks and shearing developed in the four intermediate spans. Fortunately, sufficient timber had been provided for the six spans and most of this has been put on.

I inspected this bridge recently and found little or no movement in the bottom chords since strengthened.

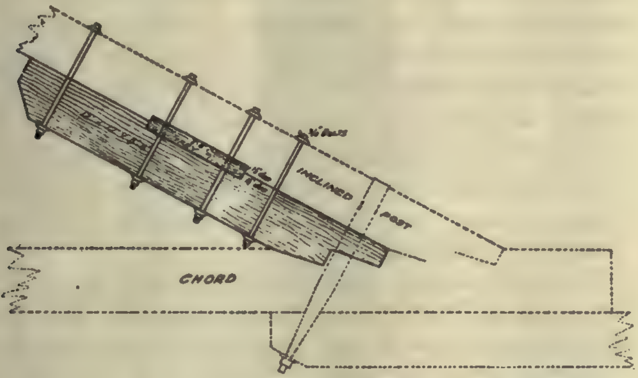
Ingraham Bridge (Greenwood District, 160 ft. H. T. span).—Recently all three leaves in one bottom chord parted. The clamp of the outside leaf joint sheared off in the fourth panel; the clamp of the joint of the inside leaf sheared off in the fifth panel from the west end, and the center leaf is evidently broken under the prism between these. These joints are open from 2¼ to 2½ in., allowing a sag of between 2½ and 3 in. in the truss, and all that is holding the tensile strain are eight ¾-in. bolts and one lateral rod. Arrangements were immediately made to keep the traffic to the other side of the bridge as much as possible, limit the load and put a temporary bent under the center of the truss, also to have a doubt bent pile pier, with a good sloping nose at upstream end put in under the fourth panel from the west end. This will make the span good for years.



METHOD OF STRENGTHENING BOTTOM CHORD WITH EXTRA LEAVES—SEE (2)

These breaks are only another proof of the weakness of the present design, chiefly due to decay of the bottom chords caused by the wooden clamps and packing and the absence of properly designed keys between the leaves. There are many other bridges of similar design throughout the province that have about reached the age when they will require close watching.

The covering of the chords with galvanized iron, as has been adopted, if properly put on will prevent the moisture from the outside from reaching the timber, but this does not entirely eliminate the cause of the decay, for if the spaces between the timbers comprising the chords are not left open for the free circulation of air, the sap in green timber is sufficient to cause decay.

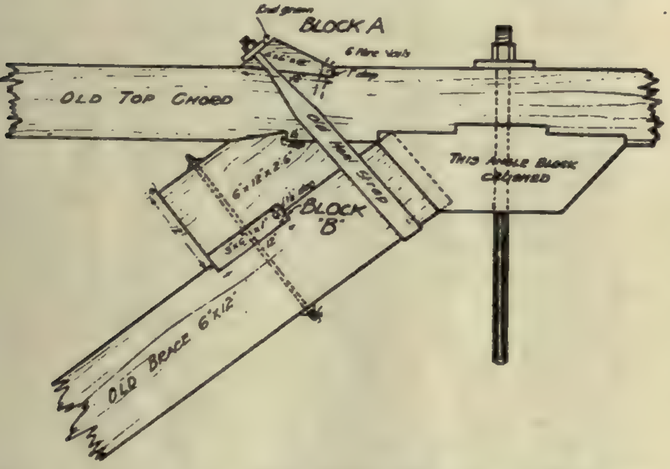


METHOD OF STRENGTHENING LOWER END OF INCLINED POST AND BOTTOM CHORD OF KINGPOST OR QUEENPOST TRUSSES—SEE (7)

I strongly recommend this important question, together with the question of increasing the number of panels in the designs of the various lengths of Howe truss spans, to this convention for their consideration and feel confident that with the hearty cooperation of all concerned the life of British Columbia wooden bridges can be much increased.

Craigflower Bridge

This was a pile trestle bridge and the recent failure was due to the action of what is commonly known as sea lice. It is said that those only attack



METHOD TEMPORARILY SUPPORTING MAIN BRACE WHEN ANGLE BLOCK IS CRUSHED—SEE (8)

timber immediately above the ground line in tidal waters.

The upper portion of a pile that had been removed was examined. Eighteen inches of the lower end were badly eaten away, particularly near the end, which was of oval form about 3x5 in. in cross-section, and 18 in. above this the pile was sound to its full diameter, about 12. in. The wood was eaten on all sides, but not evenly, and was absolutely destroyed so far as it had been penetrated by these worms. There was from ½ to 1 in. of honeycombed wood adhering to the good wood on all sides; the balance had eroded.

Careful inspection of all timber work in tidal waters should occasionlly be made. If the action of those worms is confined to near the surface of the ground, as above stated, these examinations should only be made at extreme low water.

Some Methods of Strengthening Old Truss Bridges

1. Plan of temporary support for a broken bottom chord, with three sets of two rods each: In most of the districts there are old truss rods that can be utilized for this purpose. These can be put in quickly and will add much support until the necessary men and material are available to put in a more permanent method of strengthening.

2. Plan of an effective method of strengthening bottom chords by reinforcing them with extra leaves on the sides: This plan shows a usual method of putting a reinforcing leaf on the outside and an extra clamp on any joint of the inside leaf that may have weakened. By this method the outside leaf can be put on with thick keys without interfering in any way with the bolts or rods of the old chord, except that it may be necessary to cut off the ends of some extra long chord bolts, and in some instances it may be found necessary to shorten some of the lateral braces to allow the extra inside clamps to be put on. If necessary, an extra leaf may be put on the inside, but this requires much more labor, necessitating a temporary system of lateral bracing and the shortening of the old braces.

When doing this work care should be exercised in cutting the key seats in the old chord as far as possible from the clamps or packing of the old chord, and in the direction of the trestle stress.

There is another method of putting on extra leaves by framing them similarly to the leaves in the old chord, putting the keys directly opposite the old keys and clamps and replacing the old chord bolts and lateral rods with larger ones. This method will much increase the expense, and would not be suitable for old bridges with wooden clamps and packing, for where these are the chords are badly decayed, in most instances only a shell of good wood on the outside being left, and under these conditions it would be unwise to further weaken it by cutting away the outside surface.

3. Plan for a system of castings, bolts and rods to directly connect a broken center leaf in a bottom chord: When the break occurs about the center of the panel four of the small castings with the necessary bolts and rods may be used, but when the break occurs near the angle block it will be necessary to use

(Concluded on page 34)

Suggestions for Financing a Provincial Highway System*

By A. W. CAMPBELL†

The subject upon which I have been asked to address you presupposes that the objective to be attained is a provincial highway system. Now, whether fighting, building a nation's highways, or giving a general talk, it is well to know what is our objective. The question then arises—"What is a provincial highway system?" The answer depends largely upon the authority and powers of the department in each province having the administration of its highways. Now in the Provinces of Prince Edward Island, Nova Scotia, New Brunswick and British Columbia all roads are under the jurisdiction and control of the central provincial government both as to construction and maintenance. Consequently, a provincial highway system in these provinces embraces and includes by-roads and side roads as well as main or trunk roads. A centralized form of administration of highways in these provinces is, therefore, necessary.

Now, if Nova Scotia may be taken as typical of the provinces having a provincial highway system of this type, we find that their "Provincial Highways Fund" taps six distinct sources of revenue, as authorized by their "Public Highway Act of 1917." These are: (1) Such sums as may be determined by the Governor in Council, not exceeding the amount voted by the legislature of the province for the purpose; (2) all motor license fees; (3) all sums contributed by the Federal Government to encourage and assist the improvements of highways; (4) direct taxes on ratable property and income amounting in cities and towns to 1 mill and in other municipalities to 4 mills, together with a poll tax of $1, or, if not assessed, a poll tax of $3; (5) certain income from Crown lands; and, (6) special contributions by municipalities, corporations, associations or persons.

Each of these sources of revenue, with the possible exception of the direct taxes, and, in the cases of the prairie provinces, of income from Crown lands, are now available and open to each of the provinces of Canada. This statement could not be made when the provincial legislation of Nova Scotia just referred to was passed, because the Canada Highways Act, which appropriated $20,000,000 to encourage the provinces in constructing and improving their highways, became law only on July 7, 1919. As many of you are aware, this act makes available to the different provinces 40% of the cost of constructing or improving such highways as the provinces designate to come under the act and subsequently submit such information regarding the public necessity of the various highway projects and as to location, cost, description, specifications, time and method of construction, as is satisfactory to the Federal Government. The regulations under the act stipulate that this information shall be submitted in what we term a "project statement." This statement includes information as to the authority for and sources of provincial and local funds where such funds are to be used in connection with any project.

At the present time, direct property taxes, including the poll tax for highway purposes, are exigible in Canada only in the provinces mentioned as controlling all their roads. While such tax levies for highway purposes usually go into the general fund of these provinces, this source of revenue may be capitalized and the proceeds expended on roads of a particular class. Such highways generally embrace the main trunk roads connecting the principal centers of population and distribution, linking up a series of market roads. Generally speaking, in the central provinces, that is from British Columbia to New Brunswick, this class of roads constitutes what is commonly known therein as a "provincial highway system." In these central provinces all direct property taxes, including those for road purposes, are collected and spent by the various municipal councils of each province. There is no gainsaying the fact that there has been a strong disinclination in such provinces as Ontario to institute direct taxation for highways or indeed for other purposes. Insofar as the setting aside of motor fees for highway construction is a form of direct taxation, there has been a departure in such provinces as Ontario from the indirect methods of taxation. Indeed the development and expansion of motor transport has been featured by a tendency toward this form of direct taxation there has been a departure in such provinces as Ontario from the indirect methods of taxation. Indeed, the development and expansion of motor transport has been featured by a tendency towards this form of direct taxation in all parts of America; and in the provinces not already having control of all their roads, there has been a further marked tendency towards centralized administration of such highways as are used to the greatest extent by motor transport.

In the United States a direct annual levy, collected by the state on property and income, for general highway expenditures or for highway debenture, is very common even in such states as New York in which the counties also make large expenditures on their highways. The fixed state tax levy varies from 0.1 mill to 2.5 mills. For highway debenture issues the direct levy, of course, varies according to the amount issued and outstanding, that is without regard to the term of the issue or the rate of interest payable The law of New York State regarding its last issue of debentures for highway purposes provided that the rate of annual tax be .005 mill of valuation of real and personal property subject to taxation, for each $1,000,000 issued or .1 mill for a $20,000,000 issue. This method of raising highway funds has the advantage that the large cities of the provinces or states are called upon to make a definite contribution toward the financing of the leading highways therein. It thereby lessens the burden of providing adequate highway transport for long distance travel, formerly imposed on local units.

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*Paper presented at the 7th annual convention of the Canadian Good Roads Association, Winnipeg, Man., June 1-3, 1920.

†Commissioner of Highways, Dominion of Canada.

Any provincial highway system fundamentally involves a classification of the roads in a given province, followed by the selection of those which carry the heaviest traffic and serve the most people for special treatment. In the case of provinces in which the counties or similar units control all roads it mean special legislation under which these highways are designated to come under complete or partial control of the central government.

In this connection it may properly be contended that prior to the proper classification of the highways of a province, there should be established in each province a department or branch of a department, with trained experienced engineers in charge, whose judgment regarding the engineering problems affecting proper locations, designs and materials for road construction will command the confidence and support of the public which pays the shot. The man on the street quite naturally feels that any large sum of money raised for the special purpose of building the roads demanded by the modern road vehicle, should be regarded as a public investment to be safeguarded. If this investment is to appeal to the public, there must be a reasonable assurance that the contemplated expenditures will be made prudently. The people want to know that their money will not be scattered around on job and patch work, but that proper care will be taken to secure the best location firm foundations thoroughly drained and consolidated, and with surface coverings economically justifiable. In this connection I am pleased to be able to state that all the provinces of Canada have already established highway departments or branches which are under the direction of experienced competent engineers acquainted with modern methods of road construction and at the same time fully alive to the limitations of local conditions. The ground, to use a figurative expression, is, in this respect, already paved and prepared for a superstructure of solid achievement in highway work. In passing, perhaps you will allow me to state that possibly the best evidence that the provinces now have capable highway organizations, which have been applying themselves to the task of classifying their roads, may be found in the fact that eight out of the nine provinces have, to date, submitted to the Federal Government, for approval, a program map of a selected system of highways in these provinces for construction or improvement under the Canada Highways Act. This means that these provinces have chosen the roads of the most general and local importance in each, for improvement with federal cooperation and assistance. The total mileage of the roads that have been so far designated as federal aid roads is about 18,000 mi.; and the total amount that is being raised by the provinces and which will be applied during the next five years on this system aggregates about $73,000,000. Consequently, it would appear that the manner in which this vast sum of money is to be obtained for highway purposes is a very pertinent question at the present time.

Now, experienced highway engineers fully realize that any highway improvements undertaken from special expenditures in grading or preliminary work should be done only with the view to the laying of foundations that will meet all reasonable requirements of future traffic; and that any gravel or stone should be applied with the view of making a suitable surface to accommodate the present requirements of traffic to fit into a finished work later on, even if that work should be of the most expensive class of pavement. Public confidence in special highway debentures would be more secure if the people were taken into the confidence of highway engineers as to the manner in which the work is to be carried on to a greater extent than has been done in the past. However, it is a well known fact that engineers are not good advertisers. Still, there is a public which looks for immediate results, forgetting that only the cheap and most impermanent structures are built in a day, and which should be informed as to what is intended.

Now let us briefly consider what is the general trend of methods of financing large special expenditures on highways. In the past, road work was but one of several so-called public works receiving the attention of a provincial department of public works. All expenditures made by such departments were usually met out of the general funds of the province. Of late, however, there have developed in practically all of our provinces special departments to deal with road matters which, in order to satisfy the public demands for improved roads, require extraordinaryily large expenditures. Since these expenditures are made largely in response to the demands of a limited portion of the public, namely, those using the roads or living adjacent thereto, a tendency towards financing the necessary expenditures from direct taxes on real property, motors or gasoline, or from capitalizations of prospective revenues from these sources in the shape of debenture issues is very strong. This method of finance has its merits. While not forgetting that there is a very great general public interest in improved conditions, owing to the decreased cost of hauling and hence a reduction in the cost of farm products, etc. to the consumer, yet it is undoubtedly a very equitable arrangement by which those benefitting directly from improved road conditions are called upon to pay the bulk of expenditures on the selected system of trunk highways placed under provincial control. It permits of the ordinary sources of revenue being applied to the less important roads, while a definite program of permanent construction is being carried out. Because debentures have, in the past, been issued for highways and other public works and have failed because the proceeds have been spent in constructing hard surfaces on unimproved grades without proper foundation and drainage, is no reason for condemning the principle of capitalizing a given source of revenue for highway purposes.

Moreover, it is a mistake to secure a large highway bond issue on the pledge of the entire revenue from motor license fees for the construction of an extensive mileage of expensive highways, unless there is or will be an assured adequate fund from other sources for maintenance purposes. Good business methods demand that provision be made for protecting the investment by proper methods of maintenance.

While many states and several of the provinces of Canada are devoting their revenue from motor licenses towards the financing of special expenditures on their roads, it would appear to be timely to consider briefly the basis on which the fees are collected from motor owners. At present there is little uniformity in this regard. One province may levy a flat rate upon all vehicles, whether used for touring or commercial purposes, having no regard to weight or horse power. Another province may distinguish between commercial and pleasure vehicles on a flat basis, while its neighbor may base the fee upon both weight and horse power. Possibly a more equitable plan would be to have regard to each of these factors. In this case the fee would be based somewhat as follows: one-third on power, one-third on weight and one-third on valuation or as a flat tax. There is no doubt that the tonnage and speed of any motor vehicle have a direct bearing on the amount of damage done by the vehicle to highway improvements, and should be taxed accordingly. A proportion of the fee based upon the assessed valuation of the motor vehicle would appear to be a fair means of taxing personal property that it not productive. However, it is doubtful that this method of levying the fee would be generally acceptable, especially in the central provinces.

In the neighboring State of Minnesota what is known as the "Babcock Plan" of financing a trunk road system contemplates raising the motor fee to $18, which is now about one-half that amount, and pledging the extra amount so raised to the creation of a special bond issue, limited in any calendar year to $10,000,000, with never more than $75,000,000 outstanding. The greater part of the revenue derived from motorists now consists of a personal property tax on each payable to the state. The average assessed value of all cars listed on May 1, 1918, was $140 per car, and the average tax on this assessment was $5.60, amounting, together with a license fee of $1.66, to $7.26 only. The "Babcock Plan" will, it is claimed, not add a single dollar of taxation to the current expenditure on highways in the state. It would appear that this method of financing highway expenditures is satisfactory all around, providing the motor owners do not kick. Further, that the motorists of the state will have nothing to lose by this increased tax is sustained by the argument that the improvements will occasion them 20% less expenditure to operate their cars than at present.

It has been estimated by an eminent French highway engineer that there is a reduction of one-third of the amount of gasoline required in driving over improved roads. This fact that the amount of gasoline used in a car is fairly proportionate to the excellence of the roads covered has been used as the basis for contending that highway improvements might properly be financed by a tax upon gasoline used for motor purposes. A tax of this nature would be somewhat difficult to collect. Each province would require that the owners of garages and gasoline supply depots give affidavits as to the amount of gasoline received by them and sold to the public for motor purposes. However, owing to the extraordinary increase in the price of gasoline within the last year, there is no doubt that a tax of this nature would not be very popular with our Canadian motorists. As a measure of alleviation of the rising cost of gasoline, it has been suggested that the provincial governments take over the control of purchases and sales of all gasoline used for motor purposes. As "The Nation" (N. Y.) puts it—"Why not one fluid more? Why not the one fluid that makes the whole world spin?" If the tax on gasoline could be collected without too much trouble and expense it would be a very fair means of arriving at the amount of service which motorists receive from a provincial highway system, and of reimbursing the public for the amount of wear and tear caused to highways by motor vehicles.

With regard to the amount of expenditure per mile of road that a debenture issue is to cover, it may be said that, providing the actual tonnage of traffic now using the road as well as the approximate increase of traffic that will result from the improvement are known, the justifiable expenditure can be readily determined. All that is required is a calculation based upon the actual differences in the cost of hauling one ton for one mile over the various classes of roads. For instance, supposing the difference between the cost of hauling one ton for one mile is 10 ct. greater over an ordinary earth road than over an improved gravel road, or in other words that there is a saving of 10 ct. per ton-mile in hauling over the gravel road; and

(Concluded on page 37)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX JULY 21, 1920 No. 3

LOCAL ROAD ASSOCIATIONS

A discussion of what can be done by local good roads associations in furthering road improvement formed the subject matter of a paper presented at at the recent meeting of the Canadian Good Roads Association by Wm. Findlay, of the Toronto "Globe." It contains much that should be of interest to all concerned with highway betterment—which means everyone.

There can be no doubt that there exists a wide field of usefulness for the smaller good roads organizations. Much of the progress that has been made in the improvement of the public highways in this country is due to their efforts. Composed, as they usually are, of representative citizens from all walks of life, they can, and do, exert a powerful influence in the forming of public opinion.

Formerly, the chief function of the local association was to wake up the general public to the need for doing something towards starting on an improvement program. At present, the work to which they can well devote their endeavors is getting the right work done in the right places, and insisting upon the necessity for the employment of competent engineers at adequate salaries.

A NATIONAL HIGHWAY SYSTEM AS AN AID TO TRUCK TRANSPORTATION

In the last installment of "Relation of Highway Transportation to Increased Production," which is printed on other pages of this issue, the establishment of a national highway system is urged as a means of fostering the development of motor truck transportation. After referring to the volume of road work that has been done and that is proposed, the author says:

"We must coordinate all this road building into a comprehensive system of highways under national control. The United States Chamber of Commerce, in a resolution passed at St. Louis, is already committed to such a program. We believe that our hopes in this direction will be best served in the passage of the Townsend Bill now before the Senate of the United States."

It is not by any means necessary—or even desirable—that all of the road building in the country be under federal control. By far the greater part should remain, as it is now, under state and local direction. All of the states have highway departments and most of those departments are better fitted to have direct charge of the work than is any existing or proposed federal agency. But much of the hauling over the highways is interstate transportation and to meet the demands of that kind of business there is a need for a measure of national control of road building.

Experience has amply demonstrated the difficulties in the way of securing continuous routes through areas under different jurisdictions. The highway systems of adjacent states may be complete within those states, but may—and often do—fail to connect properly at the boundary. The same is true of counties and, perhaps to a lesser degree, of townships and road districts. This condition is usually due to merely a lack of cooperation in planning.

The creation of state highway departments and the establishment of state highway systems have done much to remedy the lack of coordination of the highway systems of neighboring towns and counties. It is logical to expect that a measure of federal control over interstate routes would have a similar effect in coordinating the systems of adjacent states and in the eventual building of a comprehensive national highway system.

But it would seem that the most satisfactory results would be secured by limiting federal control to the selection of routes and a right to insist upon such adherence to rules and regulations governing materials and methods as would suffice to safeguard the expenditure of the funds from the federal treasury that were contributed to the work in the form of national aid. The actual work can best be left under the control of the well organized and equipped highway departments of the several states.

Methods of Repairing Timber Bridges in British Columbia*

(Concluded from page 29)

two of the larger castings on the top side to allow room for the connecting rod to pass over the angle block. By either method, for a through span, it will be necessary to notch the floor joists over the top rod. This will weaken the joists somewhat and it may be found necessary to put in extra ones.

4. Plan of placing rods and other connections to allow the changing of rods, angle blocks and braces, if supports cannot be placed below: The rods are to be tightened until the load on the truss rods is removed, when the rods, angle blocks and braces can be removed and replaced. No traffic should be allowed over the structure while any of the members are displaced.

5. Plan of struts for reducing length of span, with method of securely holding the top end and of taking the full load on these with wedges below: The foundation may be changed to suit local conditions. In some places it may be necessary to protect the struts from driftwood by either planking or the placing of a sheer boom.

6. Plan of an intermediate pier to be placed under old spans where possible: This will necessitate strengthening the counter braces when these are converted into main braces by this additional pier.

7. Plan of method of strengthening the lower end of inclined post and bottom chord of king and queen trusses: This is similar to one on a bridge in the Cowichan District and is a cheap and efficient method of strengthening the ends of these trusses where they invariably give way through decay. The foot of this additional post may be framed into one or two notches in the chord to suit conditions. If these are floor joists on the chord the ends of one or two of these will have to be cut off at the inside of the chord and the end supported by a piece bolted to the chord.

8. Plan of method of supporting temporarily the upper end of a main brace when the angle block is completely crushed: One of these was put in at the top end of the second set of main braces of a 100-ft. span that had crushed 2 in. into a rotten angle block. This was done before high water this year and the bridge is still carrying traffic.

National Research Council Committees

Dr. Adams of Harvard is Chairman of the Engineering Division and T. R. Agg, H. S. Mattimore and A. T. Goldbeck Are Named To Head Highway Engineering Committees

The National Research Council has announced the personnel of the several engineering committees appointed to carry on the work of the organization. The engineering division has been organized with the cooperation of several leading engineering societies and will conduct its work in close relationship with the Engineering Foundation. Twenty committees have been appointed to study various phases of engineering.

Dr. Comfort A. Adams, Lawrence Professor of Engineering, Harvard University, is chairman of the engineering division and is devoting his entire time to the work. The committees of interest to road builders follow:

Committee on Economic Theory of Highway Improvement: T. R. Agg, Professor of Highway Engineering, Iowa State College, Ames, Ia., Chairman; C. A. Baughman, R. B. H. Begg, L. E. Conrad, H. S. Fairbank, D. C. Fenner, R. W. Schoreder, H. J. MacIntire, H. J. Kuelling, A. N. Johnson, M. L. Ireland, H. J. Hughes, R. B. Gage.

Committee on Tests and Properties of Road Materials: H. S. Mattimore, Chairman; F. C. Lang, M. O. Withy, H. J. Hughes, R. W. Crum.

Committee on Structural Design of Roads, A. T. Goldbeck, Chairman.

Commission Appointed to Study New Jersey Motor Vehicle Laws

A commission has been appointed by Governor Edwards, of New Jersey, to investigate the motor vehicle laws of that state and make recommendations for changes in traffic laws and license fees. The members of the commission are: Watson G. Clark, formerly a member of the State Highway Commission; William L. Dill, Motor Vehicle Commissioner; Senator Thomas Brown; Assemblyman Henry G. Hershfield, and Horace A. Bonnell, of Newark.

The District of Columbia has been forced to stop repair work on streets because of inability to secure cement shipments. It is reported that a considerable amount of work is under way and must remain in an uncompleted condition until the district secures cement.

Putnam County, West Virginia, has awarded a contract for the construction of 4 mi. of hard-surfaced road extending from the Cabell County line to a point beyond Hurricane. The road will be of bituminous macadam and asphalt construction and will cost approximately $100,000. Completion of this road will leave gaps of only 7 mi. in the hard road between Huntington and Charlestown.

Berks County, Pennsylvania, recently opened bids for the purchase of $975,000 of county bonds, the proceeds of which are to be used for the construction of a bridge over the Schuylkill River and the improvement of county roads. But one bid was received and no award was made. Two months before the bonds were offered at 4½% but no bids were received and the interest rate was raised to 5% for the second asking of bids.

Exports of Petroleum Products

Exports of gasoline, lubricating oil and petroleum products from the United States are approximately $50,000,000 a month, according to the "Wall Street Journal." No branch of the petroleum industry has been expanded faster during the past year than the export business and American refiners are now meeting an unprecedented foreign demand for gasoline and lubricating oil.

Indiana Eliminates Retained Percentage

As a result of a recent conference between contractors and officials of the Indiana State Highway Commission, contractors engaged in building state highways will be advanced 100% of the contract price per mile upon completion of each mile of road. Settlement on this basis will not be final, but will be subject to adjustment until the whole mileage is completed. The proportion heretofore advanced was limited to 80%. The new plan must be approved by the State Board of Accounts before it can be put into effect.

Panama Will Build Highways

The Republic of Panama is planning the construction of highways involving an expenditure of approximately $7,500,000 and, it is reported, will seek American construction companies to undertake the work.

A cable from the president of the republic to J. E. Lefevre, Charge d'Affairs of the Panama legation, asks that representatives of road construction firms in this country be sent to Panama to discuss plans for the road building program.

It is estimated that the program worked out by Panama officials involves an annual expenditure of about $1,000,000. The sum of $1,125,000 is now available to start the work.

Traffic Problems in Shanghai

The Shanghai Municipal Council has a difficult problem in devising means to reduce the injurious effects of wheelbarrow and handcart traffic, according to "Municipal Engineering and Sanitary Record." It has been found that 75% of the wheelbarrows have loads of over 700 lb. per inch width of tire, while some loads are as great as 1,100 lb. per inch of tire width, the wheels in all cases being 3 ft. in diameter. The loads on handcarts per inch of tire width are approximately the same as those on wheelbarrows.

Because of the fact that the wheelbarrow is a single-wheeled vehicle, more damage is done to the pavement than would be expected, for the tire is seldom in full bearing with the surface of the roadway. The handcarts are poorly constructed and have considerable axle play.

Baltimore Will Standardize Specifications

A committee to standardize the paving specifications of Baltimore, Md., has been appointed by Chief Engineer Henry G. Perring and is composed of Col. R. Keith Compton, Chairman of the Paving Commission; August E. Christman, Highways Engineer; and Nathan L. Smith, Chief Engineer of the Commission for opening streets.

Bill Would Deny Federal Aid to States Without Reciprocal Motor Laws

A bill has been introduced in Congress by Representative A. J. Griffin, of New York, which provides that federal aid shall be denied to any state which refuses to recognize the automobile license of any other state. This bill, which is carried over to the next session, is aimed primarily at Maryland, it is reported, because this state will not enter into reciprocal agreements with the District of Columbia, but requires residents of the District to take out Maryland licenses, deriving from this source an annual revenue of about $150,000.

Railroad Strike Delays Road Work in Maryland

The outlaw railroad strike has caused the Maryland State Roads Commission to cancel most of its maintenance work. Oiling of roads has been ordered discontinued in several counties and shipments of stone have been canceled because of the strike embargo.

Work on about 25 construction and maintenance jobs has been stopped according to Chairman Mackall. If the present situation continues indefinitely, it is believed that the result will be that very little work on the highways of the state will be done during the present season.

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Howell County, Missouri, has awarded contracts for the construction of the West Plains-Rover and the West Plains-Siloam Roads, a total distance of 26 mi. The work will be under the supervision of Allen V. Elston, County Highway Engineer.

The City of St. Paul, Mich., has a $3,000,000 paving program. Paving projects were postponed during the war and the amount of street paving intended to be competed this season was 57 mi., of which 17 mi. have been abandoned because of protests of property owners.

The County Commissioners of Washington County, Pennsylvania, on June 22 received four sealed bids for the purchase of $500,000 worth of 5% Washington County school and road bonds. All bids were rejected except that submitted by Daniel W. Doub, offering to buy $10,000 worth at 98.

HIGHWAY TRANSPORTATION

Relation of Highway Transportation to Increased Production—III*

By GEORGE M. GRAHAM†

(Concluded from July 14)

Public interest is shown by the expenditures for hard-surfaced highways. According to estimates of the Bureau of Public Roads of the United States Department of Agriculture, these, in 1919, set a new record with a total of $138,000,000. But this figure is small in comparison with the computed available total for 1920 of $623,000,000.

Need for National System of Highways

We must coordinate all this road building into a comprehensive system of highways under national control. The United States Chamber of Commerce, in a resolution passed at St. Louis, is already committed to such a program. We believe that our hopes in this direction will be best served in the passage of the Townsend Bill now before the Senate of the United States.

This bill calls for a national system of highways to be built and maintained by the Federal Government under the supervision of a federal highway commission.

THE MOTOR VEHICLE AS A COMMERCIAL PASSENGER CARRIER—A GROWING BRANCH OF HIGHWAY TRANSPORTATION

The Townsend Bill calls for an eventual expenditure of $425,000,000, to be spread over five years. To those who argue that our financial condition forbids such a comprehensive construction, let us concede that economy is a right principle, but it should not be pressed to a point where it defeats investments necessary to prevent loss.

The high cost of living is no myth. Neither is the mud road. The prime reason for high costs is inability to deliver maximum production at prices permitting a profit to the farmer and a saving to the consumer. Waste, due to unimproved roads, is already estimated, by figures developed in a Congressional investigation, to reach the appalling sum of more than $500,000,000 per year.

Every man who believes in the facilitation of transportation as necessary to production, and who concedes a place of importance to the motor truck in the general scheme of transportation, becomes automatically a partisan of better roads.

Americans Hail the Pioneer

It is our American habit to hail the man who ventures. We immortalize the navigator who sails uncharted seas, the explorer who invades the fathomless forests. We revere a Columbus, a Raleigh, a Magellan. We thrill at the deeds of a Shackleton, a Peary. We cheer a Hawker, a Read or an Alcock. The Lewis-Clark expeition, fighting its way to conquer the Northwest for the infant republic, is one of the glories of our national history. We apply to a railroader like James J. Hill the admiring title of "Empire Builder."

Let us stop not at praising these giants who have opened world opportunities. Let us, within our capacity, emulate them.

The American business man has a chance to be discoverer, pioneer and developer. Before him lie two and three quarter million miles of unexploited highways. Let him dare to be their Christopher Columbus.

Those rude roads cry out a need. Poorly built as many of them are, they express man's need of contact with man. They lead from the palaces of the mighty to the huts of the lowly. They touch alike huge plants where thousands toil and the tiny farm where labors but one producer. They offer, in peaceful conquest, an El Dorado to make a Pizarro or a Cortez envy.

No discovery, no invention, no creation of human genius offers such possibilities to mankind as one that facilitates transportation. When Robert Fulton launched the Clermont on the Hudson, he little dreamed that he had discovered those new worlds for which Alexander sighed in vain that he might conquer them.

When Stephenson gave to mankind the locomotive, he foresaw not that he had founded an era of conquest to make the empire of a Napoleon seem negligible.

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*Paper presented at the eighth annual meeting of the Chamber of Commerce of the United States of Amercia, Atlantic City, N. J., Apr. 27-29, 1920

†General Sales Manager, Pierce-Arrow Motor Car Co., Member, Motor Truck Committee, National Automobile Chamber of Commerce.

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A revived and protected merchant marine shall carry our international, coastwise and inland waterway trade. A railway system, fairly dealt with by legislation and permitted to charge properly remunerative freight rates, shall girdle the country for bulk distance haulage. The highways, through the motor vehicle, shall spread the benefits of an infinitely developed local service.

By the union of the three in efficient cooperation, sections may be joined, production speeded, taxation reduced, the costs of the war more speedily paid and the product of our country spread at lowered costs.

To achieve this practical program in the interest of all our people involves more than material considerations. It carries a lofty service to that true democracy, whose protection, perpetuation and extension should be the highest aim of intelligent citizenship.

Delaware Farmers Plan Cooperative Distribution of Produce

A fleet of trucks that will travel over the roads of Delaware from the Maryland line through Sussex and Kent Counties, Delaware, and bring into the city of Philadelphia, Pa., fresh country produce, is being planned by a group of Delaware farmers. Stanley Marvel, a commission merchant of Philadelphia, will head the company, whose equipment at the start will consist of five trucks.

The produce and dairy products will be brought daily into Philadelphia to a central distributing station, where they will be sold to consumers. Stops will be made by the trucks at the important towns along the main roads in the section covered.

Suggestions for Financing a Provincial Highway System

(Concluded from page 32)

that there is a daily traffic of only 5 tons, amounting in a year of 300 working days to 1,500 tons. The result is clearly a gain of $150 in the cost of hauling over this mile during the year. Now, suppose you capitalize this annual saving, with interest at the low rate of 5%, and assume that such a saving continues for twenty years. Then the amount of highway expenditure that is economically justifiable on this mile is $3,000. On the same basis, there might properly be expended on a road carrying a daily traffic of 50 tons the sum of $30,000, and so on, according to the traffic. Hence, it would appear that the traffic a road is required to sustain is the determining factor in the amount of expenditure to be made thereon and of the amount of debentures required for any given stretch of road.

In conclusion, I might briefly touch on the question of the best way to sell highway debentures. Owing to the prevailing high rates of interest, it is desirable to sell an issue as cheaply as possible. This, of course, is usually done by asking for competitive bids, but there is a further consideration in connection with highway expenditures, namely, as to the desirability of offering debentures of this character to the public as a worthy enterprise that should be taken up and promoted from the standpoint of patriotism and the general public interest. While Canadians are prone to smile at some of the so-called amendments to the constitution of some of the American states, owing to their having relation to matters of essentially passing importance, there is this much to be said for an amendment to a state constitution proposing a debenture issue for highway purposes: The public becomes informed as to the nature of the benefits accruing from improved highway conditions, and lively interest is secured in promoting the welfare of the country in this regard. Our provinces are not in a position to amend their constitutions periodically by popular vote. However, there is no good reason, when debentures for highway purposes are being floated, why an active campaign should not be instituted to help in selling them, setting forth the expected benefits to be derived from the expenditure proposed and urging popular support of the debentures on the dual grounds of patriotism and good business.

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The Colorado State Highway Commission is considering a plan for illuminating the road from Colorado Springs to Denver, a distance of 75 mi.

The Iowa State Highway Commission recently announced that it would probably not approve any projects except those already under way or about to be let.

From 1870 to 1919 the Number of Horses in the United States increased 203.3%, showing an average increase for each decade of 25.5%. These figures would seem to indicate that the horse has as yet shown no signs of becoming an extinct species.

Hamilton County, Indiana, has postponed the awarding of contracts for road construction on 20 sections of county highways because of high prices. In announcing this policy the Board of Commissioners expressed the opinion that labor and materials may be cheaper next year and that also there may be a more ready market for bonds.

MEETINGS

Calendar of Coming Meetings

Aug. 10-12.—American Society of Civil Engineers.—Fiftieth annual convention, Portland, Ore. Secretary, Charles Warren Hunt, 29 West 39th St., New York, N. Y.

Sept. 1-3.—Michigan State Good Roads Association.—Annual Meeting, Lansing, Mich. President, P. T. Colgrove, Hastings, Mich.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

PUBLICATIONS

ADIRONDACK HIGHWAYS. By C. R. Pettis, Superintendent of State Forests, New York. Paper 6x9 in., 32 pages. Insert map and illustrations.

This booklet sets forth the natural charms of the Adirondack Park in New York State and then enumerates the various routes leading thereto by water, rail and road. There are included many illustrations which show the wonderful scenery of the region. An insert map showing the highways in the Adirondacks will be of great value to the thousands of tourists that visit these famous mountains each year.

CATSKILL HIGHWAYS. By G. R. Pettis, Superintendent of State Forests, New York. Paper, 6x9 in., 16 pages. Insert map and illustrations.

Not only do the Catskills possess grand achievements of nature, but also grand achievements of science. Situated in the midst of this beautiful mountainous section is the famous Ashokan Reservoir and thus the Esopus Valley provides water for the metropolis and long winding roads for the motorist. The highways which lead to and traverse the Catskills are set forth in the text and indicated on the insert map, and the scenery skirting there highways depicted graphically by copious illustrations.

THE USE OF EXPLOSIVES FOR AGRICULTURAL AND OTHER PURPOSES. By J. R. Mattern, Paper, 6x9in., 172 pages and covers. Illustrated.

This bulletin is published by the Institute of Makers of Explosives and is intended to be used as a manual for farmers, road builders, contractors and others who are confronted with the problems of rock removal, ditch digging, etc. The discussions of the various uses of explosives are thorough and complete. Stump blasting is given particular attention, as is also ditch digging. A chapter is inclued at the end which explains the properties of the various kinds and grades of explosives, also explaining the correct methods of using them.

PERSONAL MENTION

Fred Brown has been appointed city engineer of Muskegon, Mich.

W. B. Davey has been appointed city engineer of New Orleans, La.

C. J. Sheridan has been appointed deputy city engineer of Yonkers, N. Y.

Charles E. Parry has resigned as chief assistant engineer of Allentown, Pa.

G. W. Culler has succeeded O. D. Christman as city engineer of Springfield, Mo.

J. H. Syenstricker has been appointed road engineer of Monroe County, W. Va.

T. L. Williams has resigned as city engineer of New Orleans, La., on account of poor health.

Harry D. Williar has been appointed chief engineer of the Maryland State Roads Commission.

O. D. Christman has resigned as city engineer of Springfield, Mo., and will enter private practice in that city.

Charles Schultz has resigned as city engineer of McKinney, Texas and is now connected with the Southern Construction Co., Dallas, Texas.

L. L. Rogers has resigned as field engineer of the Lakewood Engineering Co., Paving Department. He is now connected with Roger Bros., Los Angeles, Cal.

H. F. Johnson has resigned as resident engineer of the Wyoming State Highway Department and is now office engineer of the Midland Bridge Co., Kansas City Mo.

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McLennan County, Texas, voted on June 23 a bond issue of $365,000 in the Mart District.

Clearfield County, Pennsylvania, has voted a $1,000,000 road bond issue. The total vote of the county was 4,246 for and 2,906 against the issue. An analysis of the vote, it is reported, indicates that most of the opposition was developed in the rural sections, which are to receive the greatest benefit by the construction of the roads.

County Officials of Wichita County, Texas, have signed a petition asking for the removal of County Auditor W. W. Murphy on the grounds that he is wilfully delaying construction work of county roads by failure to approve bills presented him by Potts & Prentice, contractors. This firm is engaged in building a concrete road system in the county and $20,000 in payments to the contractors has been held up by the auditor because of alleged irregularities.

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By PREVOST HUBBARD

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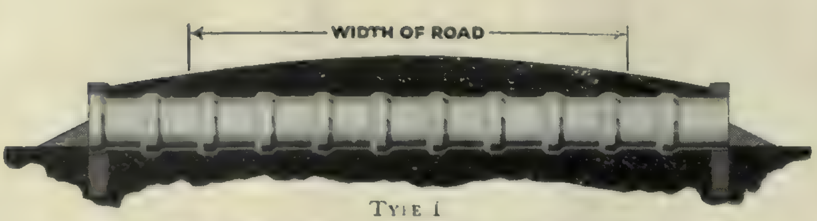

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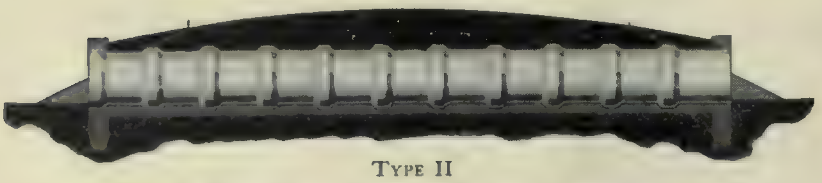

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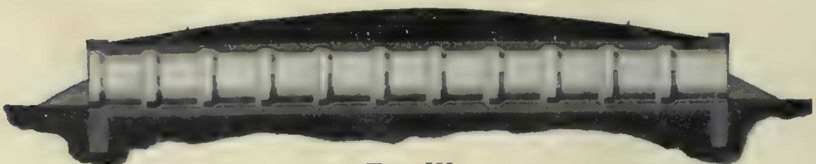

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Convict Labor in Nebraska

By GEO. E. JOHNSON*

Nebraska is employing convict labor to construct state and federal aid road projects located in Johnson, Seward and Pawnee Counties, including a total of 45 mi. and representing the second undertaking of the state in contracting with the State Penitentiary for the use of such labor to build roads.

The really important phase of the construction of these roads lies in the fact that nearly 50 men, chosen carefully by the warden of the state institution, are given an opportunity to engage in one of the largest enterprises ever undertaken by the state, and are gaining thereby the confidence of state officials, as well as self reliance, a quality which will enable them to find a place of usefulness when they once again are free men.

During the early part of April of this year, the Department of Public Works held a road letting, at which it was decided to reject all bids of road projects found in the above mentioned counties. Such action was taken because of the excessively high prices bid for earth excavation, and it was thought that the state could take over the building of these roads at estimated prices and complete them by using convict labor. Consequently, camps were established near enough to Lincoln so that the state officials might easily inspect the work. Such employment, besides furnishing an outdoor life, it was thought, would help strengthen the moral fiber of the men. The work has been in progress a little over nine weeks, and has proved successful, so far, from every standpoint.

VIEW OF TECUMSEH-CRAB ORCHARD ROAD IN NEBRASKA—BUILT BY CONVICTS

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*Secretary, Department of Public Works, Nebraska.

The camps are established on land rented from farmers. Each camp consists of six bunk-houses, built on portable bodies, and are light enough to be pulled by mules from one camp location to another. Two connecting bunk-houses provide the kitchen and dining room, while a third furnishes sleeping quarters for the road foreman, serving also as an office. These houses are 20x9 ft., and are well lighted and ventilated. In the dining room is a built-in table, around which are long benches, and the kitchen is equipped with built-in cupboards, a six-hole range and ample work tables. The equipment for each entire camp outfit totals $595. The cost of each building, mounted on wheels and body of a farm truck, is $590.

Each man in the three camps receives $1.50 a day for his work and in addition is furnished wit food, lodging and tobacco. The state institution receives 75 ct. a day for each man, netting each week, approximately $72 from each camp where there are 16 men at work. The cooks and supervisors, or guards, are paid from the state road fund. The money that is received from that work is turned over to the warden, who, in turn, sees that the families of the men get it, or, in case there is no family, it is given to the prisoner when his term expires.

There is an abundance and variety of food that is served to the men. At the camp located at Tecumseh, the cook formerly cooked for the warden. There are several detail helpers, for it is nearly impossible for one man to cook for over 18 men, three meals a day, without some aid. The menu for supper on one day at the camp included fried pork chops and potatoes, two vegetables, iced tea or coffee, dried peaches, loganberry pie and chocolate cake. The dining room and kitchen are screened, and ice is provided for the refrigerators. Many of the supplies are bought from neighboring farms, but canned supplies are bought in wholesale lots. Usually the camps are located in the center of a 3-mi. stretch of road that is to be built, the work thus progressing 1.5 mi. in each direction from the camp.

The prison garb has been discarded and the men work in ordinary work clothes. Although this is not the practice in many states, it is believed that the men feel more at ease, and will try to make good as workmen, not being handicapped with the disfiguring prison stripes. Before the men were sent out, they were told that they were put on their honor, and that by disobeying any of the camp rules, they would not only bring reproach upon themselves individually, but would make every member of the entire camp suffer. However, the majority of the men are so well satisfied that they do not care to leave. One man, whose time expired recently, has asked to be allowed to be paroled to the foreman of the camp, for he is well satisfied with the kind of work and the treatment given him.

Briefly, the rules of the camp are as follows: All men shall obey orders from the supervisors; no one is permitted to leave the camp after work in the evening unless accompanied by one of the supervisors; no cigarette smoking is permitted in camp; there is to be no profane language used; each man is held responsible for the treatment of his team; no brutality to the teams will be tolerated; each man is expected to look after his bunk, and it must be kept clean and in good condition; the hour for retiring must not be later than 9 o'clock; promiscuous visiting with strangers is not permitted.

Two guards, or supervisors, as they are called, are employed, one for day, and one for night duty, but there is nothing to indicate forced control. The general tone of the camp is identical with that of any road camp in the state, and the men are treated as human beings and not as prisoners.

Athletic sports are encouraged. As soon as the men return from their work, they can be seen hurrying about, in order to get possession of the base ball paraphernalia. However, base ball is not their only pastime, although they have played several neighboring teams, and enjoy the distinction of having won from semi-professionals. One evening the entire camp was taken into Tecumseh to the moving picture house, at the expense of the townspeople. These people are interested in the work, and motor out to the camp in the evening to see how the work is progressing.

Perhaps the most popular of the camps is the one located at Table Rock. This camp is composed of colored men, and is one of the happiest of the three. The location is ideal. The bunk-houses are on high ground and overlook miles of rich farming land. The order at this camp is especially good. At six o'cclock in the evening, the men ride into camp on the wagons, and each wagon is placed in an even row. The machinery is also lined up on the sidehill in perfect order. After supper the strains from songs sung by John McCormack, Louise Homer and Alma Gluck can be heard, for the camp boasts of a graphophone.

"We have such fine folks to work for, and everyone is so contented, that we are all going to make good," said one negro, when asked how he liked the new work. "None of the camps has an overseer like ours," he concluded, with a smile that revealed a row of shining white teeth. Many times since the camp was started, it has been necessary to send the men many miles away from the camp for supplies. They always return promptly with the supplies.

Each of the three camps averages about 30 men, and 20 teams of mules and horses. None of the stock belongs to the state. There is a double outfit at the camp, consisting of 125 hp. Holt tractors, two

(Concluded on page 45)

The Value of the Local Association in a Nation-Wide Highways Movement*

By WM. FINDLAY†

Today Canada stands on the threshold of the greatest highways development in her history, and if the plans now in works are carried to completion it is hard to conceive that this country ever again will have to devise a highways project which will be comparatively so novel, so bold, so extensive, or of such cost. I do not mean that present plans for road building are the greatest which will ever be undertaken by the provinces or by the Dominion. Far from it. The era of road building upon which we are now entering is going to be permanent. It will, we hope and confidently expect, never be ended. For all the highways never will be built so long as human effort falls short of human ideals.

But I do mean that this country will never again be confronted with any general national road building program which will involve so great a change from existing conditions, and which will be so much in line with the most advanced thought among good roads advocates, and by the same token, so far in advance of the thought of the general public on the necessity for improved highways.

Perhaps it may be that at this present time my feeling is akin to that of the people of Ontario when, 22 or 23 years ago, it was suggested that $1,000,000 of provincial money should be set aside for road building, the municipalities contributing a proportionate amount. Politicians stood aghast at the size of the project to spend this amount of public money, even though it was to be spread over several years. Before it was thought safe to entrust the proposition to the Legislature it was necessary to have a public inquiry, and the wardens and reeves were brought in from the counties and townships—not particularly to ask them what they thought of the scheme, but by the discussion of it to familiarize them with the movement, and to secure their support in their various communities for what was considered a stupendous movement in the direction of better roads.

And what was the great sticking point with these legislators next after the size of the money vote they had in mind? The question was whether, in the interest of economical construction, better maintenance and the securing of through routes of travel, the townships could be induced to turn over to the counties a number of their leading roads.

Just at this time that great missionary of better highways whom we have here today, and who is now properly at the head of the Dominion Highways Department, Mr. A. W. Campbell, entered upon his official connection with the Government of Ontario. He went up and down the province, holding meetings here and meetings there. Little meetings they were, held in the schoolhouse or township hall. I have heard him tell of the half dozen or half hundred progressive farmers who would attend, and of how the gospel of good roads was propogated, and always the subject of his thesis was to get the leading roads under the control of the larger governing bodies. That has been his effort for 25 years. It was crowned in Ottawa last year when the Dominion legislation was passed, and the leading roads of all provinces, and connecting the principal centers of the east and west, may now come under a measure of control of the Federal Government and receive federal aid.

The process of education by discussion started by the inquiry I have spoken of was carried on in another way, and a more widespread way, because many men undertook the work. The Ontario Good Roads Association was an infant two or three years of age at that time. It is a veteran today, not too old to be vigorous nor too young to be experienced. Its members are the very class of men who make public sentiment throughout the counties. They are largely the men who represent the townships and the counties in their municipal affairs. No good roads association in Canada has a better record for progressiveness or continuous active service or for the faculty of translating thought into action than the Ontario Good Roads Association. I speak disinterestedly of this body because I have never been a member of it.

Today in Ontario we are not discussing whether leading roads should be county roads or township roads but whether they shall be provincial highways or parts of the federal system. That is the advance that we have made, and I contend that in so far as Ontario is concerned this advance is due primarily to three causes: first, the educative work of the Provincial Highways Department inaugurated by Mr. Campbell, and so actively and successfully carried on by Mr. McLean; second, the increasing influence of the Ontario Good Roads Association and other more local associations, and the constant effect of the discussions which take place at their conventions; and, third, the influence of the automobile, both the car owned by the farmer and the car owned by the city man.

The motor leagues and associations have been great factors in stimulating good roads thought. They have convinced the people of the urban communities that good highways concern not the farmer alone, as was imagined 25 years ago. They have paid their good money for highway improvements to their various provincial governments in the form of automobile licenses—millions of dollars— and millions of dollars of it is still in the possession of these provincial governments, and has not yet been spent on good roads, I am sorry to say.

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*Address at the 7th annual convention of the Canadian Good Roads Association, Winnipeg, Man., June 1-3, 1920.

†Business Manager, "The Globe," Toronto, Ont., Past President, Eastern Ontario Good Roads Association; Director, Canadian Good Roads Association and Ontario Motor League.

They have gone further, and have convinced the people of the towns and cities that it is a proper thing for them to contribute through their tax bills as well for good roads in the surrounding counties. The motor car owners of the cities have done a great and good work through their associations and leagues.

I do not wish to discriminate as between these two classes of organizations. Each has a field. Each has developed its opportunities. Each is dependent for complete success upon the other. And it is idle in any section of the country where the two classes exist to expert to score 100% in the development of good roads thought without organization of the men of the rural communities and of the motor car owners in the towns, and then to secure active and harmonious cooperation between the two organizations for specific purposes.

Perhaps your committee asked me to speak on the subject of "The Value of the Local Association in a Nation-wide Highways Movement," not because I have been close to good roads development in Ontario for many years so much as to enable me to indicate what a local association of good roads enthusiasts of every class and character can do, and in one particular case has done.

In Eastern Ontario up to three years ago the good roads activity was represented largely by the Ottawa Motor Club and a few purely local good roads associations. Through the efforts of the Ottawa Motor Club and the organization they were able to get together along the route the highway to the St. Lawrence at Prescott had been projected and promised. Other sections in that part of the province were clamoring in a disjointed way for better roads, but their efforts were inneffective because there was no broad general program in which all could join.

Most of the roads concerned led into the city of Ottawa. The problem, so far as that city was concerned, was insurmountable until the toll gates which confronted the traveler on every leading road near the capital could be taken down and the privately owned highways could become the property of the people and subject to public control. The question had been on the boards for twelve years, and no progress towards a solution had been made.

The Eastern Ontario Good Roads Association was formed in the summer of 1918, and to the success of its initial meeting and of all the work it did a great deal of credit is due to the newspapers, daily and weekly, of that part of Ontario. Publicity was the foundation stone of its success. The publishers came at their own expense to a meeting held for that purpose, and pledged their support to the movement, and they gave that support willingly and without stint. It was a movement purely public in its nature, but it embraced the selfish interest of practically every town in which a newspaper was published.

The support of the municipalities was sought and secured. They sent their men as delegates to meetings and they contributed their money.

The policy of the Eastern Ontario Good Roads Association was to urge the selection of all through roads in that part of the province as provincial highways or provincial county roads. The provincial highways along the St. Lawrence and from Prescott to Ottawa had been decided upon, as well as the provincial county road from Morrisburg to Ottawa. To these roads, largely as a result of the activities of the Eastern Ontario Good Roads Association during 1918, there were added as provincial county roads three other highways: One following the Lower Ottawa River to the border of the Province of Quebec; another traversing the Ottawa Valley northerly to the town of Pembroke, and a third crossing through the Rideau Lakes country and the agricultural sections of Leeds and Frontenac to the City of Kingston. The petitions for these roads, prepared and circulated by the Eastern Ontario Good Roads Association, were signed by over 7,000 ratepayers, and adopted by numerous municipal and commercial bodies.

But another, and even a greater accomplishment, was that of bringing the city of Ottawa and the County of Carleton together in the establishment of a suburban road commission under the laws of Ontario. Ottawa was the last of the larger cities in the province to take advaantage of this legislation, although perhaps it contained more good roads sentiment to the square yard than any other city. Because of the outside influence which the Eastern Ontario Good Roads Association was able to exert the city and the county got together and adjusted their difficulties. The Suburban Road Commission was formed, the toll gates came down, and now Ottawa is in a position, as she never was before, to give an entrance to permanent highways connecting with other centers in all directions, and will become, as she has a right to, the highway center of the eastern portion of Ontario.

The work of the Eastern Ontario Good Roads Association was not confined by any means to the hard roads. A great deal of discussion at its meetings was devoted to the township and county problems. It was a cosmopolitan institution, ready to consider highway problems of every character, and it therefore received the support of all classes of good roads enthusiasts. It believed that the people on every concession were entitled to easy access to the permanent roads.

All big movements in Canada must have their roots widespread if they are to be successful. An association like the Canadian Good Roads Association can be powerful only if back of it there are local

(Continued on page 45)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Articles by road builders are solicited. They should be short and, f possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX JULY 28, 1920 No. 4

RAIL SHIPMENT OF ROAD BUILDING MATERIALS

Protests against embargoes and increases in freight rates on road building materials are outstanding features of the news in the road building field. Without doubt, those responsible for the policy of the railroads feel that they are acting with wisdom, but it is difficult to find arguments in their support.

What would be thought of a railroad that accepted various kinds of freight, but placed an embargo upon shipments of materials for the reconstruction, repair or upkeep of its own roadbed? Although this is not exactly similar to placing an embargo upon road materials, the two cases are not entirely without similarity.

Highways and railways are dependent upon each other, and the railway is more dependent upon the highway than is the highway upon the railway. Industry and commerce flourished for many centuries before there were any railways; highways and waterways carried the traffic. The railroads have made possible the present methods of carrying on commerce and they are necessary to its continuance under existing conditions. But they are not indispensable, for were they to be destroyed, the country's commercial and industrial life could still go on. It would go haltingly for a long time, but eventually the functions of the railroad would be taken over by other agencies. Doing without the highways would be a far more serious matter—probably an impossibility.

Just now the railroad's dependence upon the highway is not so obvious as it might be. Freight is piling up and there are not enough cars to move it. The railroads are in the position of many others—they have more business than they can attend to. These conditions are not likely to last indefinitely. Sooner or later the railroads will be looking for business, as they have in years past. When that time comes, their attitude towards highways and highway betterment will be different from their present attitude and different from that they have sometimes taken in the past. The railway's dependence upon the highway as a feeder will be appreciated and taken into account.

The railroads transport huge volumes of goods enormous distances, but they meet only a part of the country's transportation needs. Except in rare instances, every haul begins and ends on the highway.

Placing embargoes on road building material is bad business for the railroads themselves. It is still worse from the point of view of public necessity.

ROADS FOR MOTOR TRUCKS

Almost every day brings a new example of the dependence upon motor trucks for the transporttaion of goods. Foodstuffs are hauled from the farms to markets, lumber is brought out of the forests, raw materials of one kind and another are carried to the factories, and manufactured articles are distributed to wholesalers and retailers.

Much of this business is of the short-haul variety, but a no inconsiderable portion is long-distance hauling. Regular routes of five or six hundred miles no longer attract much general attention.

Manufacturers in some parts of the country have made practically no shipments in weeks except those by truck.

This development of truck hauling is partly due to the growing appreciation of the advantages of highway transportation and partly to the inability of the railroads to take care of the business offered them.

In view of this ever increasing demand for long-distance truck hauling it would seem self evident that there is a greater need than ever before for the betterment of the highways. Yet there is a constant tendency toward curtailment and retrenchment, not all of it due to the undoubted difficulties attendant upon the prosecution of road work under existing conditions in the material and labor markets.

Utter paralysis of industry and commerce is inevitable without transportation. Until recent years the rail carriers were looked to for nearly all haulage except that over very short distances. Under the strain of war and the blight of government operation, the railroads have gone so far towards demoralization that bringing them back to their pre-war degree of efficiency will require time—a longer time than either producer or consumer can wait. The nation's business must go on while the railroads are being rehabilitated and since it cannot go on without transportation, more and more must recourse be had to the motor truck.

And if trucks are to render anything like the maximum service of which they are capable, at least passable roads must be provided for their operation.

It is realized that labor is needed on the farms and in the factories, by private enterprises and in public work. The scarcity of some materials is acknowledged. No doubt exists as to the high cost of labor and of materials. These are the handicaps under which road building has to be carried on, but they must be looked at only as handicaps, not as insurmountable obstacles. One of the country's chief needs is a better system of roads and provision for that need will go far towards restoring normal conditions.

United States Selected for Fourth International Road Congress

Permanent International Commission of Road Congresses Has Resolved to Extend Invitation to Hold Fourth Congress in United States if it Joins Association

(Special to GOOD ROADS)

The following communication has been received from Mr. Rees Jeffreys, late Secretary to the Road Board, and member of the Permanent International Commission of Road Congresses.

"The first meeting since the war of the Permanent International Commission of Road Congresses was held in Paris during the first week in July. It is proposed that the Fourth Congress shall be held in 1922 and, if the necessary arrangements can be made, the congress will be held in the United States, and failing such arrangements, in Italy.

"In view of the large developments that have been made in all forms of road construction in the United States during the past few years, it is felt that the congress would be more instructive if held in that country than elsewhere. It appears, however, that an invitation cannot be extended by the American Government until the necessary act is passed through Congress. If it is found impossible to get that act through both houses in time for the invitation to be sent this year, an invitation which has been received from the Government of Italy will be accepted.

"It will be in the recollection of those interested in the international movement for the improvement of roads that at the London Congress, held in July, 1915, an invitation to hold the Fourth Congress in Munich in 1916 was extended by the German Government. Mr. Rees Jeffreys represented Great Britain at a meeting of the Permanent International Commission held in Munich in December 1913 to make the necessary arrangements and to prepare a list of the subjects to be considered. The outbreak of war rendered all these arrangements futile, and the developments that have since occurred, and in particular, the increased growth of motor traffic in every country, will make some alterations necessary in the subjects for consideration at the congress to be held in 1922.

"There was a representative gathering at the recent meeting of allied and neutral countries. The British representatives were, J. S. Killick, M. Inst. C. E., Lt. Col. C. W. Bressey, representing the Ministry of Transport, and Rees Jeffreys, Honorary Secretary of the London Congress. Sir Henry Maybury and P. Boulnois were unable to be present. The late enemy countries were not represented, and the question of their readmission to the Congress was discussed and it was resolved to make such readmission dependent upon their admission to the League of Nations.

"A Mahieu was elected president of the congress and Le. Gavrian, secretary general. It appeared from informal discussions that took place between the representatives present that the chief difficulty in the way of restoration of roads in the countries on the Continent is one of finance. In France, the Chamber of Deputies has not yet voted the financial proposals put forward by the Ministry of Public Works, and in consequence the Department of Bridges and Roads has not yet been able to arrest deterioration in many part of France. In England, the financial provision will be secured at the expense of the motoring community. The only country that is spending money liberally on roads is the United States, where an extraordinarily rapid development has taken place. The various states are raising highway loans of large amounts, and spending very large sums of money in constructing and improving roads."

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Germany has Filed with the Reparations Committee a claim that 215,000,000 marks should be deducted from the 7,000,000,000 gold marks due France, as representing the value of improvements made on French roads by German prisoners of war.

Convict Labor in Nebraska

(Concluded from page 40)

road plows, and six wagons. By using the Holt tractors, which were given to the state in the surplus war equipment, it is estimated that at least 12 head of horses are saved. The expense of feeding the stock averages between $1,000 and $1,200 a month for each camp. The Holt tractor alone consumes 65 gal. of gasoline, and 3 gal of oil, for each day of 10 hours' work.

According to estimates, over 500,000 yd. of grading will be completed by convict labor by the first of November, if the work progresses at the present rate. The road from Tecumseh to Crab Orchard is 14 mi. in length, and the estimated price is $59,007.08; from Table Rock to Lewiston, 15.5 mi., the estimated price is $61,909.08; 7 mi. of the Seward-York-Aurora Road is estimated at $46,280.08 and the O. L. D. in Seward Co., 9 mi. in length, is estimated at $44,596.90.

These roads when completed will all form a part of the 4,500 mi. of the state highway system, which was outlined by the Legislature in 1917. The system will connect nearly every important town in the state, and will provide a well kept passable highway from every county seat in the state. It is hoped that not many years hence this same system will be paved, or if not entirely paved, that at least the larger portion of it will be graveled. It is believed that the use of convict labor will greatly further this work.

The Value of the Local Association in a Nation-Wide Highways Movement

(Concluded from page 42)

good roads associations in every province and in every section of the provinces. It may be considered that this suggestion contains the thought of selfishness, and that I am advocating the organization of local associations only to take care of local needs or desires. If there were no local needs or desires in this good roads propaganda, there would be no propaganda. This is a practical subject. We do not advocate roads for any other purpose than because we want to use them, and most of us will get the greatest use of the road nearest at home.

The watchword of this convention is "Cooperation and Coordination." Cooperate with this national organiation by forming your own local organizations, and let is help to coordinate the development of the good roads idea all across Canada in a way that only a national organization can do. Develop the good roads sentiment in your locality by a local good roads association. Decide what roads you want to improve. Lay out your program on broad lines, so as to merit as great a following as possible. Then start your educational campaign on general lines, but with the objective of securing the improvement of your particular roads. Get the motor car owners of the town joined up with the people from the townships. Connect up your local association with your provincial association and let the members of all the associations join this Canadian Good Roads Association and cooperate in its work. Let this association be your clearing house. Let it be the body which crystallizes the thought of all the local associations, and secures by cooperation that uniformity of action which a nation-wide movement demands. You will strengthen immeasurably this Canadian Good Roads Association and place it in a position where it can be of even greater service to the cause, and more thoroughly representative of good roads thought of every character and in every portion of Canada. You will help to form and you will be an important part of a closely knit fabric of good roads ambition and attainment which will extend from one end of Canada to the other. You will prove the "Value of the Local Association in the Nation-wide Highways Movement."

Road Builders and Materials Producers Protest Priority Order

Interstate Commerce Commission Hearing Brings Storm of Protest by Road Builders Against Unfair Railroad Discrimination

At a hearing of the Interstate Commerce Commission held in Washington on July 8, on priority order No. 7, which requires the railroads to give preference to the coal mines east of the Mississippi in assignment of open top cars, many protests were filed by men interested in general and highway construction work.

V. O. Johnson, President of the National Association of Sand and Gravel Producers, told the commission that the order was unreasonable and should be modified to provide partial car supply to other industries. Sand and gravel, according to Mr. Johnson, is equally as important to certain industries as is coal to others and a car service order discriminating in favor of one industry to the detriment of another is unfair.

Similar arguments were made by representatives of a dozen industries in protest against the refusal of the railroads to accept other than coal shipments in open top equipment.

Daniel Willard, President of the B. & O. R. R., who, it will be remembered, recently issued a statement advocating the curtailment of road building and diverting the labor therein engaged to the farm, was also present as chairman of the Advisory Committee of the Association of Railway Executives. Mr. Willard said in the course of his plea for the railroads: "I believe that for a time it will be necessary for the Interstate Commerce Commission in the exercise of emergency authority to order priority of service in favor of certain commodities."

John Rice, representing the National Crushed

Stone Association, asserted that road contractors are facing bankruptcy as a result of the commission's order.

A. N. Johnson, of the Portland Cement Association, described the order as "unsound business policy" and complained that it would surely cause industrial depression.

Thomas H. MacDonald, Chief of the U. S. Bureau of Public Roads, urged that 2,000 cars be available daily for the moving of road building materials, which, he said, were required to repair and maintain the highways of the country.

The hearing was continued on the following day, July 9, and many state highway officials entered protests with the commission.

I. C. C. Priority Order Interferes With Illinois Road Work

Reports are heard from all parts of the country that the priority order of the Interstate Commerce Commission, which rules that coal shipments are to be moved before road building and other materials, is retarding road construction to no little degree.

S. E. Bradt, Superintendent of Highways of Illinois, says that road construction in Illinois may be curtailed this season as much as 25% because of the transportation situation. Fifty-seven road building gangs are at work in the state completing 15 mi. of road each week, and it was hoped that the weekly total could be increased to 25 mi. In spite of the great difficulties encountered, Mr. Bradt is optimistic about the completion of the 450 mi. of road under construction this year.

Car Priority Order Extended 30 Days By Interstate Commerce Commission

Flat Bottom Gondola Cars Released to Construction Industries, and Railroads Ordered to Stop Reconsignment Abuses

The Interstate Commerce Commission on July 13 handed down a decision which extends the life for an additional 30 days of the coal priority order restricting in the territory east of the Mississippi the use of open top cars to the transportation of coal. This extension starts from July 21.

Under the new order it is stipulated that the phrase "coal car" shall not include flat-bottom gondolas of certain measurements, these cars being automatically released to the service of other industries. Accordingly, shippers of road materials have secured a measure of relief through this new order, No. 9.

Relative to the reconsignment practice of the railroads, Chairman Clark in a letter to Daniel Willard, Chairman of the Advisory Committee of the Association of Railway Executives, points out that the reconsignment practice has resulted in numerous abuses; that this evil is one demanding immediate attention of the railroads, and that it should be reduced to an "unavoidable minimum." "It seems to us," said Chairman Clark, "that it would be a very unusual situation in which more than one reconsignment should be permitted during the existing transportation emergency."

The representatives of the bituminous coal interests were in sesion when the ruling was made public, and generally, it is reported, expressed disfavor towards thè section of the new order which permits the assignmentof cars for certain specific purposes. It was recommended by the operators that coal movements be given priority over all commodities except foodstuffs and that with these commodities coal shall move on a parity.

D. B. Wentz, President of the National Coal Association, is reported to have stated that the committee of which he is chairman is prepared to take drastic and definite action in cooperation with the railroads and that a conference has been called in New York City for the preparation of plans.

Texas Protests Priority Order and Proposed Freight Rate Increase

The Board of Directors of the Texas Road Builders' Association has instructed the secretary of the association to request the Texas State Highway Commission to protest against the proposed 40% increase in freight rates on road materials and the recent priorty orders on car service.

State Highway Engineer Windrow has entered a protest with the Interstate Commerce Commission and has also sent a circular letter to all the commissioners courts in the state urging that protests by them be filed with the Congressmen of that state.

Kansas Attorney General Rules Unqualified Bids Shall Be Rejected.

The Kansas State Highway Commissioner, M. W. Watson, has issued a circular letter setting forth an opinion of the Attorney General relative to the submission of bids for highway work.

On the clause which is often included by contractors in submitting bids, that "this bid is placed conditioned upon receiving the award for all sections and reserves the right to accept less than all of the sections only at the bidder's option," the following opinion has been rendered to the commissioner:

"I do not believe that the commissioners should accept an unqualified bid and would advise that the State Highway Commission require that if a bidder shall make an unqualified bid, that the same shall be refused by the Board of County Commissioners."

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

Scarcely four months after increased salaries and wages for city employees, totaling $1,500,000 annually, went into effect, Mayor Peters is called upon by the City Men's Union Local No. 140 to disrupt the annual budget and give the laborers an increase from $4 to $5 a day and the mechanics an increase from $4.50 to $6.

The communication, signed by James D. Reidy, Secretary, came to the Mayor's desk recently. There was no wasting of words in the presentation of the demand. The Mayor was asked to grant it or submit it to arbitration. Later, the Mayor was waited upon by a delegation which explained the troubles which men of small wages are having to meet the high cost of living, especially those in the city employ who receive considerably less money than those in private employment.

In reply, the Mayor declared that there seemed to be no way that the request could be granted, in view of the lack of funds to carry it into effect for the remainder of the fiscal year. Furthermore, if he made an attempt to readjust the wage and salary schedule in conformity with the request, which also included a recommendation for a 2% increase for all employees receiving less than $2,000 a year, he would be obliged to readjust the entire schedule, in fairness to the other employees who would not be affected. Such a readjustment would mean the addition of at least $1,500,000 to the already overburdened payroll.

The request at this time comes as a surprise, in view of the lack of agitation concerning wages since the Mayor vetoed the City Council's attempts during budget hearings to secure $5 a day for laborers. Though there has been little talk at City Hall about forcing the Mayor's hand before the end of the year, the question has been discussed at the meetings of the union, to which practically all of the laborers, mechanics and clerks belong. It is declared that in their discussions the employees have had the support of certain members of the council, particularly the labor representatives, who have never forgiven the Mayor for making their salary work futile.

The laborers are saying that never before has the work been so arduous. The Public Works Department has been short-handed for nearly two years and the available force has been used to the limit in street, sewer and sanitary work since the beginning of last winter. There has been an extraordinary amount of over-time and Sunday work and the union now requests time and a half for over-time, with double time for Sundays for laborers and mechanics.

The Supply Department of the City of Boston has awarded a contract to Mace Moulton, Jr., Inc., lowest bidder, for furnishing 300,000 gal. of 45% asphaltic road oil to the Street Cleaning and Oiling Service of the Public Works Department at 17.25 ct., applied to the roads. The other bidder was Joseph J. Galvin, at 18.09 ct. per gal.

Mayor John V. Kimball, of Walden, will resort to arbitration to find out whether the street commissioners or the jitney drivers are right in their statements concerning the condition of Salem St., between Maplewood and Linden Sts., and recently he appointed a jury to go over the question and help him decide. The jitney drivers declare that the roadway is so rough that their passengers are unnecessarily jounced, and that consequently they have discontinued service. The street commissioners say that the street is all right. Meantime the people have to walk.

The Mayor wants his jury to ride in jitneys over the road in question and then decide who is right. Those he has asked to serve are Aldermen Albin Ulrich, Robert A. Hodgdon and Harry Jacques; Councilmen Wesley C. Dickey, George A. Daniels and Charles A. Miller; and citizens Fred S. Elwell, Harry H. Normine, A. A. Livermore, Frederick W. S. Tupper and Frank H. Weeks.

In spite of the objection of the Finance Commissioners of the City of Boston to the Schoolhouse Department's award of a contract to the second lowest bidder, the Public Works Department has awarded a $20,000 paving contract to the second lowest bidder, according to a statement issued by the Mayor's office.

The contract is for relaying granite block pavement in Blackstone St. from Clinton St. to Haymarket Sq. John Landis gave an estimate of $18,632.5, but the public works commissioner, with Mayor Peter's approval, awarded the contract to Coleman Bros., Inc., whose estimate was $20,431.55.

In explanation of this award, the Mayor's office issued the following statement: "The lowest bidder has had no experience in work of this kind, and at the present time has no organization or equipment available to carry on a piece of work of this magnitude. This is a street which carries exceptionally heavy traffic and the specifications require that the work be carried on night and day. Coleman Bros. have an organization and the equipment to do this work promptly and the best interests of the City will be served by awarding the contract to them."

The Norfolk County Commissioners have apportioned the county tax of $390,000 between the City of Quincy and the 27 towns of the county. It is $50,000 larger than last year. The county's share of the $14,000,000 state tax, amounting to $855,260 and not including any part of the special state tax of $660,000 has also been apportioned. The figures given out at Dedham follow:

City or town	State tax	County tax
Brookline	$250,040	$114,018.66
Avon	3,780	1,723.69
Bellingham	4,340	1,979.05
Braintree	27,720	12,640.37
Canton	18,480.	8,426.91
Cohasset	16,660	7,596.99
Dedham	39,200	17,875.27
Dover	7,700	3,511.21
Foxboro	8,820	4,021.93
Franklin	16,940	7,724.67
Holbrook	6,300	2,872.81
Medfield	6,160	2,808.97
Medway	5,740	2,617.45
Millis	5,600	2,553.61
Milton	52,920	24,131.61
Needham	28,840	13,151.09
Norfolk	3,640	1,659.85
Norwood	53,620	24,450.81
Plainville	3,220	1,468.32
Quincy	142,520	64,989.36
Randolph	9,240	4,213.45
Sharon	9,520	4,341.14
Stoughton	17,360	7,916.19
Walpole	23,940	10,916.68
Wellesley	41,580	18,960.55
Westwood	7,000	3,192.01
Weymouth	39,060	17,811.42
Wrentham	5,320	2,425.93

In 1788 a Frenchman by the name of De Warville undertook a journey to the United States in order to obtain information regarding the opportunities open for his countrymen as immigrants to this country. He arrived in Boston on July 30, 1788, and on the 9th of August of the same year he started over the road for New York City, using the public conveyances at that time in operation. Readers of this column who are accustomed to make the trip to New York now by automobile in a day, or to Springfield in four hours, will find much that is interesting in the account printed below. In this issue the traveler proceeds to a point between Spencer and Brookfield, and the balance of the journey will appear in succeeding numbers.

The distance of these towns, (that is Boston and New York) is about 250 mi. Many persons have united in establishing a kind of diligence, or public stage, which passes regularly for the convenience of travelers. In the summer season the journey is performed in four days.

We set out from Boston at four o'clock in the morning, and passed through the handsome town of Cambridge. The country appears well cultivated as far as Weston, where we breakfasted; thence we passed to Worcester to dinner, 48 mi. from Boston. This town is elegant, and well peopled; the printer, Isaiah Thomas, has rendered it famous through all the continent. He prints most of the books which appear; and it must be granted that his editions are correct. Thomas is the Didot of the United States. The tavern, where we had a good American dinner, is a charming house of wood, well ornamented; it is kept by Mr. Pease, one of the proprietors of the Boston stage. He has much merit for his activity and industry, but it is hoped that he will change the present plan, so far as it respects his horses. They are over-done with the length and difficulty of the courses, which ruin them in a short time, besides retarding very much the progress.

We slept the first night at Spencer, a new village in the midst of the woods. The house of the tavern was but half built, but the part that was finished, had an air of cleanliness which pleases, because it announces that degree of competence, those moral and delicate habits, which are never seen in our villages. The chambers were neat, the beds good, the sheets clean, supper passable; cider, tea, punch, and all for 14 pence a head. There were four of us. Now, compare, my friend, this order of things with what you have a thousand times seen in our French taverns—chambers dirty and hideous, beds infected with bugs, those insects which Sterne calls the rightful inhabitants of taverns, if indeed long possession gives a right; sheets ill washed and exhaling a fetid odor; bad covering, wine adulterated, and everything at its weight in gold; greedy servants who are complaisant only in proportion to your equipage; groveling towards a rich traveler, and insolent towards him whom they suspect of mediocrity. Such are the eternal torments of travelers in France. Add to this, the fear of being robbed, the precautions necessary to be taken every night to prevent it; while in the United States, you travel without, fear, as without arms; and you sleep quietly among the woods, in an open chamber of a house whose doors shut without locks. And now judge which country merits the name of civilized, and which bears the aspect of the greatest general happiness.

We left Spencer at four o'clock in the morning. New carriage, new proprietor. It was a carriage without springs, a kind of wagon. A Frenchman who was with me, began, at the first jolt, to curse the carriage, the driver and the country. "Let us wait," said I, "a little, before we form a judgment; every custom has its cause; there is doubtless some reason why this kind of carriage is preferred to one hung with springs. In fact, by the time we had run thirty miles among the rocks, we were convinced that a carriage with springs would very soon have been overset and broken.

The traveler is well recompensed for the fatigue of this route by the variety of romantic situations, by the beauty of the prospects which it offers at each step, by the perpetual contrast of nature, and the efforts of art. Those vast ponds of water, which lose themselves in the woods; those rivulets that wash the meadow, newly snatched from uncultivated nature; those neat houses scattered among the forests, and containing swarms of children, joyous and healthy, and well clad; those fields, covered with trunks of trees, whose destruction is committed to the hand of time, and which are covered under the leaves of Indian corn; those oaks, which preserve still the image of their ancient vigor, but which, girdled at the bottom, raise no longer to heaven but dry and naked branches, which the first stroke of wind must bring to the earth; all these objects, so new to a European, arrest him, absorb him, and plunge him into an agreeable reverie. The depths of the forests, the prodigious size and height of the trees, call to his mind the time when the savages were the only inhabitants of this country. This ancient tree has beheld them; they have filled these forests, they have now given place to another generation. The cultivator fears no more their vengeance; his musket, formerly his necessary companion at the plough, now rests suspended in his house. Alone with his wife and children, in the midst of the forest, he sleeps quietly, he labors in peace, and he is happy. Such were the ideas which occupied me the greater part of my journey; they sometimes gave place to others, arising from the view of the country houses, which are seen at small distances through all the forests of Massachusetts. Neatness embellishes them all. They have frequently but one story and a garret; their walls are papered; tea and coffee appear on their tables; their daughters, clothed in calicoes, display the traits of civility, frankness and decency, virtues which always follow contentment and ease. Almost all these houses are inhabited by men who are both cultivators and artisans; one is a tanner, another a shoemaker, another sells goods; but all are farmers. The country stores are well assorted; you find in the same shop, hats, nails, liquors. This order of things is necesary in a new settlement; it is to be hoped that it will continue, for this general retail occupies less hands, and detaches fewer from the great object of agriculture. It is not supposed that one-third of the land of Massachusetts is under cultivation. It is difficult to say when it will all be so, considering the invitations of the western country and the province of Maine. But the uncleared lands are all located, and the proprietors have inclosed them with fences of different sorts. These several kinds of fences are composed of different materials, which announce the different degrees of culture in the country. Some are composed of light branches of trees; others of the trunks of trees laid one upon the other; a third sort is made of long pieces of wood, supporting each other by making angles at the end; a fourth kind is made of long pieces of hewn timber, supported at the ends by passing into holes made in an upright post; a fifth is like the garden fences of England; the last kind is made of stones thrown together to the height of three feet. This last is most durable, and is common in Massachusetts.

New Hampshire Goods Roads Association

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There has been much comment recently on the lack of guideboards displayed on New Hampshire highways. The existing state law requires cities and towns to maintain guideboards at the junctions of all main thoroughfares. The signs are supposed to bear the name of the city or town and indicate the best route for the accommodation of travelers to neighboring towns or cities or places of interest, and the distance thereto. The law goes even further and states that the governor and council may prescribe the "general tenor and form of such signs and may direct where the same shall be placed, and cause the same to be erected, and such town shall be chargeable with all the expenses incident thereto and the same shall be added to the state tax for such town and collected therewith."

The law also provides that any such town that shall have "neglected for 20 days after notice from citor, attorney general, or the governor and council, any taxpayer of such town, of from the county soli- served upon two of the selectmen, to comply with section one, at the highway junction mentioned in such notice, shall be fined not exceeding $100 for every such failure," so it is perfectly clear that the authorities who drafted the regulation intended that it should be enforced.

The state invites tourists and provides excellent highways and then neglects the important detail of guiding the visitors to their destinations. The state roads are noticeably well provided with guideboards and this makes the negligence of the cities and towns in the matter more conspicuous.

The New Hampshire Good Roads Association might well take an interest in this matter and appoint a committee to offer suggestions to cities and towns that have failed to comply with the law and it would be of great assistance to travelers if there were some uniformity in the signs themselves, in the markings and in their location with reference to the crossroads.

The proposals for the Amoskeag Bridge at Manchester were opened on July 10 and the bids were as follows: The Conners Bros. Co., Inc., of New York, N. Y., $152,000; The United Construction Co., Albany, N. Y., $276,000.

There is a rumor that when the contract is awarded it will go to the United Construction Co., even though they are the high bidders. The advertisement calling for proposals contained the following requirements:

"The superstructure will be of steel, and the specifications for bridges carrying electric railways. adopted by the Massachusetts Public Service Commissioner, revised Mar., 1915, will be used where applicable in the design, materials and workmanshrip. The bridge will be considered city highway bridge carrying electric road, and will be designed so that at some future time a single track electric railway may be placed thereon, but this track will not be placed at the present time."

Also:

"An ordinance passed by the City of Manchester provides for an issue of bonds of $160,000 for the purpose of building this bridge, and it is expected a bridge can be built, including all overhead expenses. well within this limit."

The local labor organizations at Portsmouth are making preparations to receive the representatives of the State Federation of Labor, which holds its annual convention in this city during the latter part of this month.

State Highway Commissioner Everett has recently completed the marking of the portion of the Theodore Roosevelt International Highway that passes through New Hampshire. The official marker is a red band with white stripes above and below the letters T. R. in white on the red band. The section of the road included runs from Littleton to Conway and passes over a route through the most picturesque section of the White Mountains and this highway is one of the best in the state.

The New Hampshire branch of this national memorial association is under the chairmanship of the Hon. John C. Hitchins of North Stratford, and Frank A. French of Manchester is secretary.

There are three divisions in the association, the eastern, the central and the western, all striving to popularize, maintain and improve a transcontinental highway that not only will be a memorial to one of America's greatest men, but an asset to the territory through which it passes and a tribute to the men who are putting it across. And this goes for every man who has helped, from Portland, Me., to Portland, Ore.

The association as a whole is what the combined efforts of each state and division make it. If every county, state and division, through the combined loyalty, efficiency and cooperation of each individual, maintains the high standard already set, there will be but one result, and that a transcontinental highway that will stand alone in scenic beauty, and in the accomplishment of a project of great possibilities.

New Hampshire is called upon to provide as large a membership in the national organization as possible to lend impetus to the tourist movement over this most attractive new auto path from coast to coast. Any one interested in the state is invited to join the association. Two dollars is the sum which has been decided upon as annual dues for associate membership, all of which money is to go to marking and giving publicity to the roadway with the idea of bringing new tourists to the state each year during the vacation period.

The board of assessors of Nashua has made public the taxation figures for 1920 and the rate will be $2.48 an increase of 25 ct. over last year.

The total taxable valuation of property in the city is $35,715,391 against $27,355,315, the estimate of last year, showing a gain in real estate values of $8,360,076.

The amount of property taxed only for state and county revenue is $4,156,459.

An oil distributing outfit recently came to grief at Ashland in collision with a railroad train. The truck was owned by a Massachusetts company and was used for applying oil on the state highway between Ashland and Holderness.

The machine was crossing the track near the freight station and the operators evidently did not hear the whistle of the approaching south-bound train. There was a freight train on the sidetrack and the driver said he thought it was the whistle of the freight train. As the train struck the truck both men jumped and neither one was injured. The truck was carried over 100 ft. and during its ride on the cowcatcher, the oil tank was thrown off and rolled down the street.

The switches were torn up and when the train came to a stop the truck was a mass of junk. The truck caught fire and the Ashland fire alarm was sounded and the fire department responded with its chemical and extinguished the blaze.

Both trains were delayed over an hour before the wreck could be cleared. The cowcatcher of the engine was torn off and other damage was done to it. The truck was valued at about $8,500.

The New Hampshire State Motor Vehicle Department, up to July 1, registered 30,700 automobiles which is 4,150 more than were registered during the same period in 1919.

Bids will be opened by the State Highway Commissioner on July 29 for the construction of 1,000 ft. of concrete road in the City of Concord.

On July 2, the Piscataqua Memorial Bridge commissioners signed the firts contract in relation to the construction of the new structure which will eliminate the necessity of paying toll to cross between Maine and New Hampshire in Portsmouth. The contract was signed with the Strauss Bascule Bridge Co., of Chicago, for $51,000 and by it the bridge commissioners obtain the right to use the patents possessed by this company in the construction of a bascule type of bridge. The company will furnish all specifications and plans and will also have certain supervisory work to perform. When the plans are drawn for the structure, bids will be requested by the commission.

New York State Road Builders' Association

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Crusher Run

The estimates for the month of June were unusually large. Samuel Rosoff, the Rosoff Engineering Co., being in the lead, and ranking highest. He had two estimates on his Broome County job, one for $18,550.80, and the other for $25,303.07. Hats off to "Sammy."

Mr. C. Gordon Reel, formerly State Highway Commissioner, has been appointed appraisal engineer with the income tax bureau of the internal revenue office.

The W. T. Thayer Co., Chateaugay, N. Y., were low bidders at the Montpelier, Vt., letting, which took place on July 1, for the construction of 4.03 mi. of bituminous macadam road in South Burlington and Shelbourne.

The following were low bidders at the New York State highway letting on July 2: Belmar Contracting Co., Inc., Columbia Co., $63,911.50; David Schoentag, Greene Co., $103,373.50; Armstrong & Trowbridge, Ulster Co., $95,226.40; W. L. Lawton, Warren Co., $70,598.00; Wm. J. Semper, Lewis Co., $79,099.38; Morrell Vroman, Fulton Co., $13,679.92.

There were ten roads advertised, four of which had no proposals. There were no bids on the Dutchess, Albany, Rensselaer and Oneida County jobs.

Pressure is being brought to bear upon the State Canal Board to award the contract for the construction of the 23 piers of the Great Western Gateway Bridge over the Mohawk River at Schenectady, N. Y. The board is faced with the question of awarding the contract at a figure almost $300,000 in excess of the engineer's estimate. The question of constitutionality has been raised by Attorney General Charles D. Newton.

Royal K. Fuller, former Secretary of the State Highway Commission, who is at the present time engaged in publicity work in New York City, was a welcome visitor during the past week among his old highway friends.

Commissioner Greene delivered an address to the 9 division engineers and the 57 county highway superintendents at a recent conference. The establishment in May of the gang system on the highways of the state, to take the place of the patrol system, was unanimously endorsed. It was the opinion of the superintendents that more work had been done under the new system than in any one year under the former system. A vote was taken to the effect that more work, greater efficiency, and great saving to the state were the results of the new system.

At the suggestion of Commissioner Greene, at the conference, it was determined to ask the next Legislature to pass a bill giving the state the right to acquire 50 ft. of land on each side of the highway. The attention of employees was also called to the ban on political signs on state highways.

The joint Legislative Highway Committee of the state, and members of good roads construction committee, met at Saratoga Springs, and among other important decisions concluded to construct no more new roads until the present system had been connected, there being hundreds of places in the state where motorists are obliged to cross from an eighth of a mile to 10 mi. of unimproved road before striking another improved highway. The plan is to build all the connecting links of the state highway system at one time.

———ooo———

Grayson County, Texas, on June 12 voted a $50,000 bond issue in the Whitewright Road District.

Mobile County, Alabama, will have an increased road tax revenue for 1919 and 1920 of about $20,000, which will be set aside for highway improvements in the county. The asesssed value of property was recently increased and any money available for transfer from the general fund to the road and bridge fund from the 1919 taxes, will be applied to the new special fund.

MEETINGS

Calendar of Coming Meetings

Aug. 10-12.—American Society of Civil Engineers.—Fiftieth annual convention, Portland, Ore. Secretary, Charles Warren Hunt, 29 West 39th St., New York, N. Y.

Sept. 1-3.—Michigan State Good Roads Association.—Annual Meeting, Lansing, Mich. President, P. T. Colgrove, Hastings, Mich.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

PERSONAL MENTION

A. A. Poter has been appointed dean of engineering at Purdue University.

J. C. Carrington has been appointed county engineer of Matagorda County, Texas.

J. H. Fithdan has been appointed supervisor with the New Jersey Highway Department.

H. B. Chapman has been appointed city engineer and superitendent of streets of Richmond, Cal.

P. M. Bowen has been appointed district engineer of the New Mexico State Highway Department.

M. C. Polk has resigned as county roads engineer of Butte County, Cal., and will enter private practice.

C. S. Hidel, formerly Assistant State Engineer of Montana, has succeeded A. W. Mahon, as state engineer.

R. E. Royall has been appointed associate professor of highway engineering in Washington and Lee University.

S. D. Strong has resigned as city manager of Sault Ste. Marie,, and is now city manager of Plymouth, Mich.

C. E. Donnelly, Assistant City Engineer of Kansas City, Mo., has been appointed office engineer of the city planning commission.

A. E. Lodger of the U. S. Bureau of Public Roads has been appointed district engineer in charge of the Southeastern District.

B. H. Faber has resigned as assistant county engineer of Polk County, Texas, and is now county engineer of Colorado County, Texas.

A. W. Mahon, State Engineer of Montana, has resigned and is now a member of the firm of the Western Construction Co., Helena, Mont.

J. F. Witt, formerly engineer of Dallas County, Texas, is vice president of the South Central Division of the National Highway Traffic Association.

Harvey Dartt, has resigned as city manager of Mankato, Minn., and is now connected with the Barrett Co. at Minneapolis, as division engineer.

D. C. Grove has succeeded George Land as advertising manager of the Blaw-Knox Co., Pittsburgh, Pa. Mr. Grove was formerly connected with the Ingersoll-Rand Co.

F. J. Lewis has been appointed assistant professor of engineering at Lehigh University. He was formerly assistant engineer with the Departments of Streets and Engineering, Springfield, Mass.

E. P. Neuschwander has been appointed assistant engineer of the designing department of the New York Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission.

A. E. FOREMAN

Alvah Ernest Foreman, C. E., B. Sc., recently elected president of the Canadian Good Roads Association, was graduated from McGill University, leading his class throughout the course and obtaining some thirty first prizes. After graduation he traveled for one year. He has successively been secretary and manager of the Concrete Engineering and Construction Co., Vancouver, B. C.; a partner in the firm of Dutcher & Foreman, consulting engineers, Vancouver; resident engineer in charge of construction of the Revelstoke Dam in British Columbia; supervising engineer, Dallas Road sea wall for the City of Victoria and the Province of British Columbia; construction engineer on Smith's Hill Reservoir, Victoria, B. C.; assistant city engineer of Victoria, and public works engineer of the Department of Public Works of British Columbia.

———ooo———

Carroll County, Maryland, has made application to the State Roads Commission for the county's share of this year's lateral road fund, with which to build 11.5 mi. of road at the present time and 17.5 mi. of road at some future time, involving an expenditure of $192,000. The county will float a bond issue to meet the appropriation of the state.

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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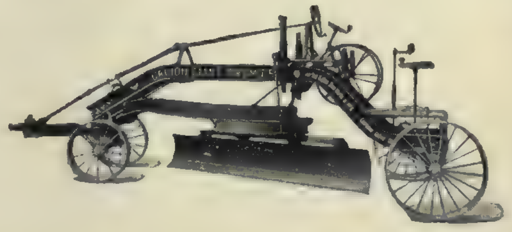

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244

Waterbound macadam road looking north from village of Saugatuck, Michigan, treated with "Tarvia-B" in 1917, 1918 and 1919.

West Michigan Pike, near village of Douglas, Mich. Waterbound macadam treated with "Tarvia-B" in 1917, 1918 and 1919.

In oval: Waterbound macadam road near South Haven, Mich., patched with "Tarvia-KP" and treated with "Tarvia-B" 1918, 1919

West Michigan Pike, Van Buren County, Michigan. Waterbound macadam roadway treated with "Tarvia-B" in 1918 and 1919. Part of a 15 mile stretch of Tarviated roadway.

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
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JAMESTOWN, AUGUST 4, 1920
Number 5

Sampling Highway Pavements

Necessity of Uniformity and Regularity of Samples—Disadvantages of Hand Cutting—Core Drilling Methods and Tools—Typical Outfits

By F. A. McLEAN, A. M. C. M. I.*

With the close of the war and the inauguration of the so-called reconstruction period in the United States and Canada, large appropriations have been made, and probably will continue to be made for some years to come, for the construction of new and better highways and the repair and maintenance of those already in existence.

A remarkable feature in connection with this field of reconstruction has been the almost universal desire to obtain accurate records of the relative merits of the different substances used in highway construction. This information is to be used as a basis for the determination of the materials best suited for various classes of traffic under different conditions, an understanding of results obtained in the past being a guide to better attainments in the future.

In many localities it has been found desirable to take and preserve samples from completed highways and streets for the purpose of making laboratory tests indicating the thickness and the resistance to compression and climatic conditions, of the various substances used in highway building. The practice of taking these samples from the pavements by a gang of men armed with hammers and chisels, or picks, is unsatisfactory, both from the standpoint of labor cost and the size and quality of the specimen obtained. It is practically impossible to get a solid piece representing completely the true thickness of the pavements, and the samples secured in this way, being irregular in shape, are difficult to store; and as they are likely to contain cracks and fissures as a result of the shocks imparted to them during their removal, they cannot be relied upon to give a true indication of the strength and wearing qualities of the pavement from which they were taken. Another objection to securing these samples by hand is the difficulty of adequately repairing the irregular shaped

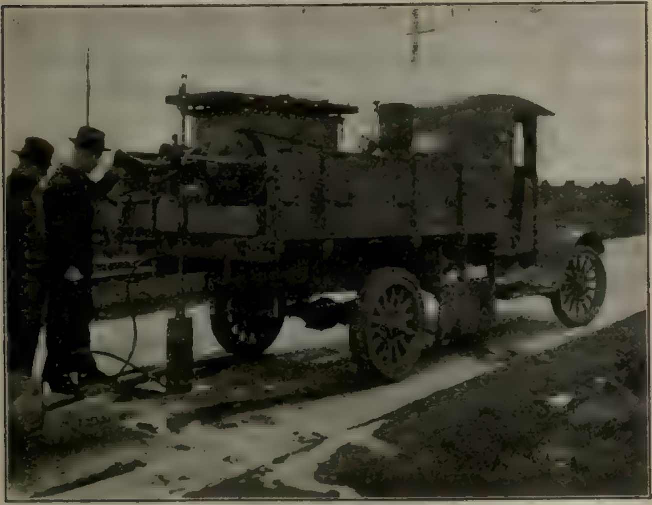

Fig. 1.—Operation Started

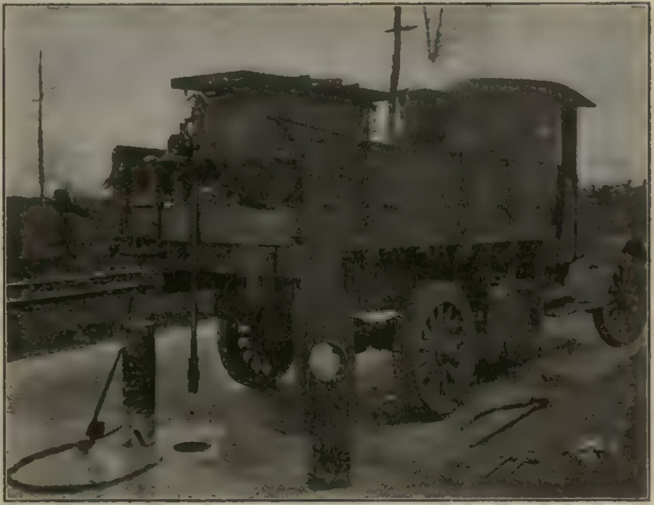

Fig. 2.—Drilling Completed

PAVEMENT SAMPLING EQUIPMENT OF PENNSYLVANIA HIGHWAY DEPARTMENT IN OPERATION holes left in the pavement from which they are extracted.

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*Canadian Ingersoll-Rand Co., Sherbrooke, P. Q.

Core Drills Used to Obtain Samples

A study of the good results secured in the testing of masonry foundations and walls by the use of core drills has led some of the more progressive municipalities and highway and paving contractors in the United States to use them as a means of obtaining high grade samples of various paving materials, in which connection they have proved very satisfactory. Core drills are of two general types—diamond drills and shot drills. Diamond drills are usually not practicable for extracting cores of a larger diameter than 2 in., and while larger cores have been made, the high cost of the diamond-pointed bits usually prevents them from being applied to fields other than the exploration of large mines, where the cost of holes per foot drilled is of no great consequence. The Davis Calyx core drill uses, instead of diamonds as a cutting agent, a quality of steel shot of a special grade known as Calyxite, which is fed to the edge of the bit by a stream of water under moderate pressure. Calyxite costs but a few cents a pound and the diameter of the core obtained is limited only by the size of the outfit used.

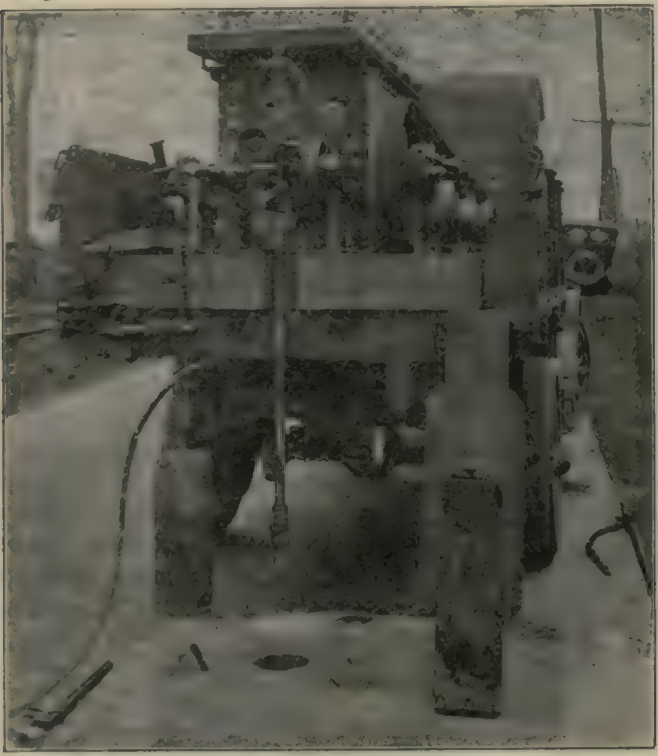

FIG. 3.—VIEW SHOWING CUTTING TOOL AND CORE READY OR SHIPMENT

By the use of such a drill it is possible to quickly and cheaply secure cores through the roadbed, of small diameter, with very few failures and without the use of a large amount of unskilled labor. This is done without danger of fracturing or destroying either the core or the pavement surrounding the hole from which it is extracted; and the hole, being of comparitively small diameter, is easily repaired by filling it with a mixture of broken stone and cement, or by inserting a concrete cylinder slightly smaller than the hole to be plugged and filling in the interstices with cement.

Samples of Uniform Size

The samples being of a uniform size, they may be depended upon to give a more accurate indication of the strength and wearing qualities of the roadbed than those extracted by hand. They also lend themselves more readily to tagging and storage for reference purposes. By the use of a shot bit 5½-in. in diameter, the diameter of the hole in the pavement will not exceed 5¾-in. and the core produced will be about 4½ in. in diameter when taken from material of a solid nature, such as cement or bituminous concrete. Loose material without any form of binder, naturally cannot be cored, but the cutter can be applied to the drill, which will cut a hole with straight sides in roadbeds of this type, thereby making possible an accurate examination of the sides of the hole.

Core drills of the type described are obtainable in a number of different sizes and styles for hand, electric, steam or gasoline engine drive, and for portable and stationary use. Portable types mounted on a wagon or an automobile chassis are best suited for use in road and paving work. An outfit used by the City of Des Moines, Ia., consists of a drill with steel frame, mounted on a substantially constructed 4-wheeled hand truck and driven by a 1½ hp. gasoline engine. As most of the work done with this outfit is performed on the city streets, the water required for washing the cuttings from the hole and feeding fresh shot to the bit is obtained from nearby hydrants, and where this is not possible a sprinkler cart is brought into play. This outfit is operated entirely by one man, and beyond the cost of oil, gasoline and steel shot, the pay of the operator is the only expense incurred in extracting the cores.

Production of Cores

Several hundred 4½-in. cores have been taken from concrete, brick, asphalt and bitulithic pavements with this outfit, the number of cores taken in a day varying according to the nature and depth of the material to be cored. On ordinary concrete pavement, varying from 6 to 8 in. in thickness, it is possible to secure 12 to 15 cores per day. On harder pavements it is not practicable to maintain this speed. Production in the case of pavement over 8 in. in thickness, where the concrete is composed of a gravel aggregate, is from 6 to 7 cores per day. Cores may also be taken from brick pavements, providing the grouting material is of sufficient strength to hold the pieces of brick together during the cutting operation.

The radius of action of an outfit of this type is limited by the fact that it carries no tank, pump or other means of securing a supply of water and its use is, therefore, restricted to city streets where a

(Continued on page 60)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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TESTING PAVEMENTS

Within the past decade there has been a development in the science and art of highway engineering that is probably seldom appraised highly enough, even by those in closest touch with it. One of the outstanding evidences of the advance that has been made is the practice of testing materials. It is also not unusual to test samples of completed pavements. One method of obtaining samples for such tests is described on other pages of this issue.

The more general testing of pavement samples would be of great advantage to highway engineering. Material tests are of very real value, but they are not enough; the results of the most scientific and exhaustive tests of cement, sand and stone naturally do not suffice to indicate the character of a concrete made by mixing them. The testing of pavement samples has an added advantage in that it provides a means for determining the character of the pavement not only when new, but also after different periods of wear and under varying climatic conditions.

Road building is essentially a progressive art. Traffic has increased enormously in volume and changed materially in character during the past ten years and its growth and modification still continue. Highway engineering practice has changed and will keep on changing to keep pace. The more general testing of pavements will go far towards keeping practice up to date.

MOTOR TRUCKING AS A BUSINESS

To even the casual observer of present conditions the hauling of commodities by motor truck must look like a promising business. Undoubtedly it does hold worth-while possibilities for anyone who is willing to enter the field with sufficient capital and after as careful preliminary study and thorough preparation as would ordinarily precede a business venture.

The possibilities of profit in highway transportation are due, of course, to the tremendous demands of modern commerce and industry and the inability of existing transportation agencies to meet those demands. The existing situation is unusual, for even if production is below normal—as is so frequently claimed—the railroads are unable to keep up with it. It is reasonable to hope for a very considerable increase in railway efficiency, but even were it to be restored immediately to its pre-war standard, it is doubtful if the rail carriers would prove adequate. There would still be sufficient short-haul business, partly between points nominally served by railways, partly over routes converging at rail shipping points and partly in territory without other means of transportation.

Before undertaking the establishment of motor truck lines, however, very thorough investigations must be made, if success is to be assured. The mere absence of motor transport facilities is not a sufficient guarantee of profits. The volume and character of freight, the rates charged by existing agencies, routing, the likelihood of competition, the ability to secure loads both ways, and labor conditions are some of the factors to be considered.

In addition, the character of the roads and their condition must be given the most careful consideration, the difference between good and bad roads often being the difference between profit and loss.

Motor trucking is a business that is bound to grow and to offer exceptional opportunities to those who are prepared to undertake it. Already it has done much to stimulate highway improvement and it will be perhaps the most powerful influence for greater efforts in the future. And as better and better roads are provided, the business of highway transportation will grow better and better.

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Citizens of Ward 1 of Union Parish, Louisiana, have petitioned the Police Jury to order an election for the purpose of a referendum on a proposal to levy a 5-mill tax on all assessed property in the ward for a period of ten years, together with a per capita and a vehicle tax, for the purpose of building good roads.

Indiana's Last Toll Road Made Free

The one remaining toll road in Indiana, a part of the old Corydon and New Albany Pike, in Floyd County, has been freed by the county commissioners on payment of $10,000 in cash and $15,000 in 5% bonds to the New Albany, Lanesville and Corydon Plank Road Co. The road had been operated for about 50 years.

Indiana's Program of Highway Finance

Bill to be Introduced at Special Session Will Raise Tax Levy to 30 ct. per $100 of Property and Yield $18,000,000 Annually

A bill has been prepared for introduction at the special session of the Indiana Legislature, which will raise the highway tax levy from the present 3.9 ct. on each $100 of taxable property to 30 ct.

Where the commission now has approximately $7,750,000 for the 1920 program, it will have between $26,000,000 and $30,000,000 available in 1921 for road and bridge construction if the measure becomes a law. The present highway tax rate yields the commission about $2,250,000, the difference between this amount and $7,750,000 being made up from federal aid, automobile license fees, inheritance taxes and other revenues. If the proposed bill is enacted into law, the increased tax levy on the total taxable property of the state will yield about $18,000,000.

Maryland's Plan to Market Bonds

State Highway Officials Considering Plan to Sell State Road Bonds to the Counties if Other Buyers Can Not be Found for Them

Unless the State of Maryland can sell its $1,500,000 bond issue authorized for road work in 1920, highway construction will be greatly curtailed in that state. Since the State Roads Commission has followed the policy of not selling bonds for less than par, it is thought that the bonds, which bear 4½% interest, will be disposed of with difficulty in the regular channels for marketing highway bonds.

A number of conferences have been held between Chairman Mackall of the State Roads Commission and representatives of counties anxious to have road building carried out, and a plan is under consideration whereby the counties will purchase the bonds to provide for the work done in the counties. If no legal obstacles are encountered, it is probable that such method of financing highway work will be put into operation.

The plan of having the counties buy the road bonds was suggested by a delegation from Carroll County, which signified that that county was willing to purchase $100,000 of the bonds at par, providing the money were spent in Carroll County. A tentative agreement to substantially the same effect has been made with Frederick County.

The $1,500,000 bond issue will be advertised for sale on August 9 and if this plan is carried out, Maryland will have found a very practical solution of the problem of financing highway improvements by circumventing the heavily glutted bond market.

Removal of New Jersey State Highway Commission Upheld

Governor Edwards Acted Within His Rights in Replacing Old Commission, According to Recent Ruling of Attorney General of State

Governor Edwards was completely sustained by an opinion of Attorney General McCran upon the summary dismissal of the State Highway Commission, the appointment of a new commission and the calling of the Senate in special session on July 27 to consider the appointments.

It is held by the attorney general that there is no question about the power conferred upon the governor by the highway law to summarily dismiss from office any or all of the commissioners, saying also that under the constitution the governor has the power to make ad interim appointments while the Legislature is in recess. The appointment of the commission is, therefore, valid and the new board may function until appointments made by the governor are confirmed by the Senate.

It is also held by the attorney general that the governor has the power to convene the Senate whenever in his opinion such action is required by public necessity.

The Bohemia River Bridge in Cecil County, Maryland, near Elkton, has been closed to traffic because of the sinking of the piles on the south end of the structure. The closing of this bridge will affect travel from the coutnies on the eastern shore of Maryland, as it is on the only direct route to Baltimore.

Citizens of Cumberland County, New Jersey, have petitioned the Board of Freeholders to loan the state $260,000 until 1922 for the resurfacing of the Bridgeton-Shirley Road with concrete, such action being taken at the suggestion of the State Highway Commission. Cumberland County, it is said, is the only county in New Jersey without a mile of hard-surfaced road.

The County Commissioners of Cambria County, Pennsylvania, have appropriated $100,000 for improving the Southmont Boulevard, a connecting link between Johnstown and the Menoher Highway, which is now under construction and which will shorten the distance between Johnstown and Pittsburgh by about 10 mi. Bids on the Southmont Boulevard will be received for both brick and concrete construction.

Mercer County, New Jersey, Increases Interest Rate on Road Bonds

The Board of Freeholders of Mercer County, New Jersey, has increased the interest rate on a $670,000 road and bridge bond issue from 5% to 6%. The bonds were offered for sale several months ago and not a bid was received. The bonds are to be used in taking up temporary loan notes issued by the county for road and bridge work.

Georgia Highway Law Held Constitutional

The Georgia Supreme Court has handed down a decision which holds the State Highway Act constitutional, reversing the decision of Judge Pendleton, made several days before in the Fulton County Superior Court.

The question of the constitutionality of the act arose when W. A. Wright, State Comptroller General, refused to honor requisitions on the highway fund. Mr. Wright took the position that the law was not constitutional because it had been passed by the Legislature by a viva voce vote, instead of by an aye and nay vote, which, he maintained, is required in measures carrying appropriations. Attorney General Denny concurred with him in this opinion.

This action of the court makes the highway fund of $1,700,000 immediately available.

Many County Unit Bond Petitions Filed in Indiana

Proposals Totaling $40,000,000 Filed With the Tax Board Will be Acted Upon After Special Session of Legislature

Proposals by Indiana counties to build between $40,000,000 and $60,000,000 worth of roads under the county unit road law are either now before the State Board of Tax Commissioners or will be laid before the board if it will indicate that it will approve any county unit road bond petitions.

However, Fred A. Sims, Chairman of the Indiana Board of Tax Commissioners, states that the board will approve no county unit bond issues until after the special session of the Legislature, also adding that if the Legislature does not change the law, the board will not approve more than two or three of the scores of petitions now on file, or in preparation.

Because the State Highway Commission took no action toward the improvement of the Michigan Road, between Indianapolis and South Bend, a number of good roads advocates along the route are proposing that each county from Marion to St. Joseph join in floating county unit road bonds and that the counties build the sections themselves. The estimated cost of this road is $3,500,000.

Automobile License Funds in Indiana

Indiana issued 301,922 automobile licenses during the first six months of 1920, securing $1,905,140 in revenue from this source. Starting with this year, funds secured from the issuance of licenses will be turned over to the State Highway Commission. The law previously provided for the distribution of the money among the counties of the state.

A bill will probably be introduced at the special session of the Legislature asking that the license fees be increased. The measure will have the support of the State Highway Commission, and, it is reported, will be favored by Governor Goodrich. The accrued revenue, if the bill passes, will be used to carry on the construction of the state highway system.

County Bonds to Small Investors

Authorities of Washington County, Maryland, Considering Advisability and Legality of Selling Small Lots to Individual Investors

The commissioners of Washington County, Maryland, have under consideration a plan for selling a bond issue of $540,000 to small investors. Bids were asked a short time ago on the issue, but all bids were rejected, except one for $10,000 worth of bonds. Following the rejection of the bids, inquiries were received by the commissioners from individuals who wished to purchase small amounts of the bonds.

An opinion on the legality of the sale of bonds without first advertising for sealed bids has been asked of County Attorney Harry Brindle. It is the belief of some citizens of the county that the law authorizing the issuance of the bonds provides that sealed bids must first be asked before any bonds can be sold.

Kansas Counties Buy Freight Cars To Insure Delivery of Materials

The road commissioners of districts Nos. 7, 8 and 9 of Crittenden County and the Ozark Trail district of Poinsett County, Arkansas, have purchased 105 open-top railroad cars so that road work in these sections will not be delayed because of the inability of the railroads to supply cars. The cars will be delivered in 30 days, according to the terms of the sale. It is reported that the cars were originally built for a road machinery manufacturer and were especially designed for hauling road building materials.

The highway program of these districts involves the expenditure of $3,000,000 for the construction of 50 mi. of concrete pavement and 115 mi. of gravel roads. The work is being pushed vigorously and much equipment has been bought to carry on the work; 15 spurs have been built for unloading, 10 cranes have been placed in operation and several fleets of motor trucks are used.

Motion Picture Films for Promoting Good Roads

List of Films Available for Promoting Highway Betterment and Motor Trucking

To those interested in promoting good roads or stimulating the interest of a community in passing a bond issue for highway improvement, the news that a number of motion picture films depicting the advantages of good roads are available at small expense will be of interest. In a recent bulletin of the Municipal Reference Library of the City of New York a list of good roads films is given, which includes information where each may be obtained and rental price, if any. The list is as follows:

"Concrete Road Construction." (1 reel.) Obtainable from the U. S. Dept. of Agriculture. Cost of rental, transportation charges only. Shows construction of a concrete post road in Ohio.

"Granite Paving and Curbing," (3 reels.) Obtainable from the U. S. Dept. of Agriculture. Cost of rental, transportation charges only. Shows story of granite pavement from quarry to finished pavement.

"Gravel Road Construction." (1 reel.) Obtainable from U. S. Dept. of Agricuulture. Cost of rental, transportation charges only. Shows construction of gravel road in Virginia.

"Macadam Road Construction." (1 reel) Obtainable from U. S. Dept. of Agriculture. Cost of rental, transportation charges only. Shows construction of macadam road in Maryland.

"Motor Truck Transportation." (1 reel.) Obtainable from the Lincoln Highway Association, Detroit, Mich. Rental cost, $25. Shows benefits of motor transportation.

"Over The Roads of Victory." (1 reel.) Obtainable from Universal Film Co., 1600 Broadway, N. Y. City. Cost of rental, transportation charges only. Shows motor truck fleet tour.

"Open Road to a Greater America." Obtainable from Universal Film Co., 1600 Broadway, N. Y. City. Cost of rental, transportation charges only. Shows development of America by highways and railroads.

"A Road to Tomorrow." (1 reel.) Obtainable from the Lincoln Highway Association, Detroit, Mich. Cost of rental, $25. Advocates passage of bond issues for good roads.

"Ship by Truck." (1 reel.) Obtainable from Universal Film Co., 1600 Broadway, N. Y. City. Cost of rental, transportation charges only. Shows adaptability of trucks for short hauls.

"Start Something." (1 reel.) Obtainable from Universal Film Co., 1600 Broadway, N. Y. City. Cost of rental, transportation charges only. Shows "Ship by Truck" methods.

"Testing Rock to Determine its Value for Road Building." (1 reel.) Obtainable from U. S. Dept. of Agriculture. Cost of rental, transportation charges only. Shows methods of testing rocks.

"Transcontinental Drive on the Lincoln Highway." (7 reel.) Obtainable from Lincoln Highway Association, Detroit, Mich. Cost of rental, $25. Shows construction work, points of interest, etc., along the Lincoln Highway.

"Trucking Through Dixie." (1 reel.) Obtainable from Universal Film Co., 1600 Broadway, N. Y. City. Cost of rental, transportation charges only. Shows truck tour through the south.

"Danger Ahead." (1 reel.) Obtainable from Universal Film Co., 1600 Broadway, N. Y. City. Cost of rental, transportation charges only. Shows the use of automobile headlights.

Delaware Convicts Work on Roads Unguarded

Long term convicts are being sent out unguarded on road work by Warden M. S. Plummer, of the New Castle, Del., Workhouse. The men are working many miles from the prison and are sent out in trucks in charge of fellow convicts who act as foremen. Warden Plummer says that he is confident that the experiment, which is declared to be without precedent in prison management, will be successful and that the percentage of escapes will be less than under the old system.

Charges for Street Openings in Philadelphia, Pennsylvania

An ordinance was recently introduced in Philadelphia, Pa., which provides for increased charges for making street openings. The bill was drafted with the cooperation of Acting Director Wagner of the Department of Public Works, Chief Dunlap of the Bureau of Highways and the Committe on Public Works of the Common Council. The reason given for the increase by Mr. Wagner is that the cost of restoring streets has increased so that the new charges are absolutely necessary.

A comparison of the charges made at present and the charges fixed by the ordinance is as follows:

Character of Pavement	Present Charge	New Charge
Asphalt block on gravel base	$5	$15
Asphalt block on concrete base	8	25
Bituminous macadam on any base	9	20
Cobble or rubble on gravel base	5	10
Granite block on gravel base	10	12
Granite block on concrete base	12	25
Granolithic or conerete on any base	10	20
Sheet asphalt on any base	13	20
Slag block on gravel base	..	12
Slag block on concrete base	..	25
Vitrified block on gravel base	8	15
Vitrified block on concrete base	14	25
Water-bound macadam on any base	6	15
Wood block on concrete base	18	25
For breaking on unpaved street:		
One opening	2	2
Each additional opening	1	1
or tunneling a paved street	..	20

The Legislative Program of the North Carolina Good Roads Association

By H. M. BERRY*

As the largest constructive organization in the state and one of the largest good roads Associations in the country, the North Carolina Good Roads Association is wielding an influence that is beginning to be felt throughout the state. For the past year it has carried on an active membership campaign at the same time spreading the doctrine of hard-surfaced roads. As a result, it now has an enrolled membership of nearly 5,000 in three-fourths of the counties of the state and "good roads" are being talked of more than anything else in North Carolina.

On June 16, 17 and 18, the association held its eighteenth annual meeting in Asheville. The meeting was attended by county commissioners, state and county road officials, road engineers and contractors, and business men, from this and other states. The questions of hard-surfaced roads and the best methods of building, maintaining, and financing them were discussed thoroughly by state and national road officials. As a result of this meeting, the association will go before the 1921 General Assembly, when it meets in Raleigh, and ask that its program for state highways, comprising approximately 5,000 mi., be accepted and financially provided for through taxes and the issuance of bonds at such times and in such amounts as are needed to meet an economical annual expenditure, or to meet the maximum available federal aid. At the same time, the Association will urge the Legislature to submit a constitutional amendment exempting road and other public improvement bonds from taxation. As a preliminary to this, the special session of the Legislature, which is to be convened this summer, will be asked to appoint a committee to draft a law so that it will be ready for presentation at the regular sesion in 1921. In this way, it is hoped that an adequate state highway law can be thoughtfully and leisurely worked out beforehand and that little time will be lost in having it enacted by the Legislature.

The Association, during its intensive campaign, is going before the people with a general program, the central idea being, however, to secure a state system of hard-surfaced roads connecting county seats and principal towns in every county of the state. The State Highway Commission is already at work on certain links in this system, but, without a greatly increased road construction fund, the completion of it will be hopelessly delayed. The Association has as its most stupendous task, then, the creation of such an overwhelming sentiment for hard-surfaced roads that the Legislature will be compelled to act favorably. To this end the following general program is being advocated:

FOR STATE HIGHWAYS

Construction Fund

1. Establihsment of a state road construction fund for the building of a system of state highways connecting county seats and pricipal towns by a modern system of hard-surfaced roads through:

(a) Ad valorem tax.

(b) This to be supplemented by sufficient bonds, issued at such times and in such amounts as are needed to meet an economical annual expenditure, or to meet the maximum available federal aid.

2. The use of all able-bodied state convicts in the construction of the proposed state system of highways.

Adjustment of Construction Fund

3. That the counties be relieved of the burden of building their respective links in the state highway system and if any county has constructed a portion of road which is to be incorporated with and meets the requirements of the proposed state highway system, such county shall be reimbursed either by the building of additional mileage of county roads or an equitable adjustemnt made, based on the original cost of such roads, the physical valuation of such road at the time it is taken over as a part of the state system, and the benefit derived by the county up to the time of its being taken over.

Maintenance Fund

4. Liberal license fees on all motor vehicles to be used as a state road maintenance fund and for the support and maintenance of the State Highway Commission.

5. Use of the patrol maintenance system on all state highways of sufficient strength to keep these highways in such a state of efficiency as will meet our present and future traffic requirements.

Administration

6. A strong and adequately supported state highway department, which shall be required to employ the best engineering skill available for the permanent location, supervision, and maintenance of this state system of hard-surfaced roads.

Protection of State Highways

7. That the State Highway Commission shall be empowered to make and enforce such rules and regulations as will adequately protect the state highways, when constructed, and as will protect the lives and property of the general public on these highways.

8. That all state highways have a minimum right of way of 50 ft. and a minimum surfaced width of 18 ft..

For County Highways

1. We believe that each county should employ at least one thoroughly competent road official on full time to take general supervision of the county road work.

2. We earnestly advocate that each county perfect a road organization through which to work, so as to give the most efficient and economical results in the expenditure of its road fund.

3. That the state should apportion among the counties sufficient competent engineers to take care of the engineering for the county and to advise with the county road officials as to the general organization and administration of the county road work.

4. Enactment of uniform county road legislation, and the adoption by the counties of uniform rules and regulations for the protection of the county roads and the lives and property of the general public.

5. In the interest of economy and efficiency, the abolishment of all road units smaller than the county, and the taking over by the county of all bonds issued by any township for road purposes.

The organization of the North Carolina Good

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*Secretary, North Carolina Good Roads Association.

Roads Association was the direct result of a road meeting held in Raleigh, Feb. 12 and 13, 1902, under the auspices of the National Good Roads Association, the United States Office of Public Road Inquiry, the Southern Railway Co., and the principal manufacturers of road building machinery in the United States. Since its organization, the association has worked in close cooperation with the North Carolina Geological and Economic Survey in promoting the cause of good roads throughout the state, through Professor J. A. Holmes, State Geologist until 1905, and then through his successor, Col. Joseph Hyde Pratt. During this time the Association has had as its presidents: P. H. Hanes, Winstom-Salem, 1902-10; John L. Patterson, Roanoke Rapids, 1910-1911; H. B. Varner, Lexington, 1911-18; and W. A. McGirt, Wilmington, who was reelected at the recent convention. Since 1918 the secretaries have been: J. A. Holmes, from 1902 to 1905, and Joseph Hyde Pratt, from 1905 to 1920. The writer, as secretary of the North Carolina Geological and Economic Survey, has been assistant secretary since 1912 and acting secretary since 1917, during Col. Pratt's absence in the army. She was elected secretary at the last convention. Since April 15 she has been giving her whole time to the work of the Association and will continue to do so through the next regular session of the Legislature.

Sampling Highway Pavements

(Continued from page 54)

source of water is near at hand. To provide a compact self-contained outfit, which would be capable of working anywhere along its many miles of excellent roads, the California Highway Commission mounted its outfit on the chassis of an old Ford car with a large water tank and pump driven by the 5 hp. gasoline engine which is used to drive the core drill.

With this equipment it is possible to drill an average concrete pavement in from 10 to 12 minutes, and old roads made with gravel, consisting largely of indurated sandstone, in from 6½ to 10 minutes, while concrete made from particularly hard bowlders, such as andesite, requires from 30 to 40 minutes.

Complete Equipment on Motor Trucks

A larger and more powerful outfit, using a 7½-in. cutting tool and capable of extracting cores 6½ in. in diameter, is owned by the Pennsylvania State Highway Commission and comprises a Calyx core drill, large water tank, gasoline engine, and a small hand pump, mounted on a 2-ton motor truck. This equipment is shown in action on the William Penn Highway between Easton and Bethlehem, Pa., in the accompanying illustrations.

As shown in Fig. 1, in which the drill has just been started, a 2-in. oak board with a hole slightly larger than the cutting tool is used to guide the drill when starting the hole and a stream of water from the square tank on the truck is led to the hole through a short hose and serves to wash away the cuttings from the working face of the bit. Fig. 2 shows the drill after the hole has been finished and the core removed. Note the absence of ragged edges around the top of the hole.

In Fig. 3 is shown a view of the bit or cutting tool used in extracting the cores and to the right of the bit is a core which has just been taken out and is ready to go to the laboratory for testing purposes. The small hand pump on the left of the water tank is used to fill the latter when water under pressure is not available for the purpose. The equipment is, therefore, not limited to use in cities or towns and can be easily moved from one locality to another many miles away on very short notice.

It is interesting to note that the actual time required for coring a pavement or roadbed is, to some extent, an indication of its wear resisting qualities, but so far sufficient data have not been collected to accurately determine just how far the drilling time may be taken as an indication of the probable durability of the pavement being tested.

Test pieces secured with these outfits are in splendid condition for carrying out compression and abrasion tests. Many samples which have been tested show a compression strength of 3,000 lb. per square inch for 3 or 4 year old pavement made with a mix of 1:2½:5. The borings taken from the pavement are also of considerable value in furnishing exact records of the thickness in different places and also show how thoroughly the concrete was mixed at the time it was laid.

Highway Construction in Western Counties of North Carolina

Construction work on 25 mi. of highways was commenced during the third week of June in four counties in western North Carolina. In Mitchell County, the Gibson Construction Co., of Knoxville, Tenn., started the construction of a 5-mi. stretch of asphalt road between Spruce Pine and the Avery County line.

Work was also started on State Aid Project No. 84-B in McDowell County. This road will connect with Project No. 3 on the west and will extend 1.5 mi. into Burke County, connecting with improved highways in that county. The total length of this road to be improved is 30 mi., and the road will be graded to a width of 24 ft. and surfaced to a width of 16 ft. with sand and gravel. The Creis Construction Co., of Knoxville, Tenn., is now working on the first 15-mi. section.

Wright & Nave, of Anderson, S. C., have started the construction of State Aid Project No. 70-B in Jackson County, extending from Sylvia to the Haywood County line, a distance of 12.5 mi. The road will be 20 ft. wide, with a 16-ft. gravel surface.

HIGHWAY TRANSPORTATION

Office Will Travel Over Highways

An office on wheels which has been built by the Napoleon Motors Co., of Traverse City, Mich., will travel throughout the New England States in connection with the sales campaign of the company.

NAPOLEON TRUCK EQUIPPED AS OFFICE

The office is mounted on a Napoleon truck, as shown in the accompanying illustration, and is equipped with all the office requisites necessary to carry out the work of appointing dealers and distributors for this line of trucks. The Mohican Motors Corp., New York City, is the eastern distributor for Napoleon trucks.

Serving the Sick by Motor Truck

Motor ambulances are thought of instantly on the mention of hospitals; yet motor trucks function extensively in the more prosaic task of carrying supplies and doing the general hauling.

In the accompanying illustration is shown the Acme truck operated by the West Virginia State Hospital at Huntington, W. Va. This institution is situated about 3 mi. from the city and the truck travels over the roads in that section in the hauling of fruit and produce. Under adverse weather conditions the roads are such as to try the mettle of any motor truck. The truck shown in the picture carries a load of 2 tons over a distance of 3 mi., part of which is a steep grade.

ACME TRUCK USED FOR GENERAL HAULING
BY THE WEST VIRGINIA STATE HOSPITAL

Committee Will Study Problems of Highway Transportation

A Committee on Education for Highway Engineering and Highway Transport Engineering has been organized under the Department of the Interior for the purpose of studying the relation between highways and the vehicles operating on them. The members of this committee are as follows:

Thomas H. MacDonald, Chief of the Bureau of Public Roads; Col N. H. Patrick, Corps of Engineers, U. S. A.; Roy D. Chapin, representing the automotive industry; F. L. Bishop, of the University of Pennsylvania, representing the engineering schools; W. C. Johns of the U. S. Bureau of Education; Paul D. Sargent, President of the American Association of State Highway Officials; H. S. Firestone, representing the tire industry.

This committee will take up the adjustment of highway specifications and motor truck regulations in the attempt to solve the problems arising from the rapid development of motor transportation.

Motor Truck Convoy Proposed for Bankhead National Highway

The War Department is giving serious consideration to the proposal to send an army truck convoy over the Bankhead National Highway from Washington, D. C., to San Diego, Cal., as noted in the May 5 issue of GOOD ROADS. Dr. S. N. Johnson, of the U. S. Bureau of Public Roads, is endeavoring to

ARMY TRUCK CONVOY OVER LINCOLN HIGHWAY

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secure the approval of General Drake, Chief of the Motor Transport Corps, and Secretary of War Baker for the motor truck convoy over the Bankhead National Highway.

The remarkable transcontinental trip over the Lincoln Highway last summer created great interest and besides furnishing the Motor Transport Corps a considerable amount of valuable data, also stimulated interest for greater improvements on that highway. The accompanying illustration shows Mack trucks at the head of the convoy in Market St., San Francisco, Cal., which was gayly decorated. The trip, a distance of 3,000 mi., was completed in 62 days. Because of the great interest incited by this demonstration, it is thought that a similar tour over the Bankhead National Highway will be of value in promoting good roads in the South.

Federal Highway Council Lays Plans To Enlarge Scope of Activities

That there will be no let-up in the nation-wide movement to bring the highway into its logical position as an efficient factor in transportation, is shown in the recent appointment of committees by the Federal Highway Council to direct the work in its more important branches.

The Transportation Committee of the council already includes men of wide experience in transportation problems. Cooperating with the committee are Dr. R. S. McElwee, Director of the Bureau of Foreign and Domestic Commerce, Lieut. Col. J. M. Richie, U. S. A., and Lee L. Robinson of the U. S. Council of National Defense.

W. J. L. Banham, General Traffic Manager of the Otis Elevator Co., New York, N. Y., and member of the Executive Committee of the National Industrial Traffic League, is in charge of a committee on policy towards other forms of transportation. This committee will make a careful study of short-haul and terminal problems, including consideration of transportation problems in new territory, transport surveys, terminals, store door delivery, the compilation of statistics on costs, rates, etc., and the use of trailers.

J. H. Collins, Manager of the Research Bureau of the Chilton Co., Philadelphia, Pa., is chairman of the Committee on Rural Motor Express. The scope of the work of this committee embraces the study of franchises, insurance, uniform shipping documents, methods of marketing, return loads and the present status and development of machinery for promoting the rural motor express.

The study of highway transport functions of state highway departments, as snow removal, traffic surveys and traffic control, will be in charge of David Beecroft, Directing Editor of the Class Journal Co., New York, N. Y.

The development of a policy of cooperation between truckmen and truck users will be in charge of W. H. Stone, Associate Editor, "Manufacturers' Record," Baltimore, Md.

Cooperation in educational work with universities and technical schools will be directed by Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan, and President of the National Highway Traffic Association.

Charles W. Reid, formerly Executive Officer of the U. S. Council of National Defense, is in charge of the Transportation Committee, the work of which aims to coordinate highway transportation with other forms of transportation and to promote the use of highways so that the greatest public benefit is derived from them.

F. S. Holbrook, Vice President and Treasurer of the American Railway Express Co., will represent the company on the Transportation Committee, which when completed, will include representation from all agencies of transportation.

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The State of Pennsylvania has been allowed 84 open top cars per day for the transportation of road materials.

Dauphin County, Pennsylvania, has appropriated $30,000 as its share of constructing the road between Clark's Ferry and Millersburg.

The City of Chester, Pennsylvania, will shortly start repairing the wood block pavement on West Third Street, at an estimated cost of $100,000.

The Pennsylvania Highway Department has issued nearly 500,000 automobile licenses so far this year. Receipts from the sale of licenses aggregate $7,176,761.

Storms in Delaware County, Indiana, washed out five bridges and damaged the roads of the county considerably, according to Borter Ross, County Roa Superintendent.

Farmers near Alexandria, Ind., are forming an organization for the purpose of subscribing to a $90,000 road bond issue. Work on a 2-mi. stretch of road near this city has been delayed because of lack of funds and the farmers will absorb the bond issue to hasten construction.

Winn Parish, Louisiana, in a recent election voted a road bond issue of $1,000,000, a maintenance tax of two mills on an assessed property valuation of $15,000,000 and a court house tax of about $250,000. All propositions were carried by a majority in property and popular vote of more than 5 to 1. Winn Parish has an area of 1,000 sq. mi., a population of 30,000, and is traversed by the Jefferson and Pershing Highways.

EQUIPMENT—TRADE—MATERIALS

Hoboken, Pennsylvania, Changes Name to Blawnox

The town of Hoboken, Pa., the home of the Blaw-Knox Co., has changed its name to Blawnox, a petition signed by the people of the town being recently granted by the Senate. The Blaw-Knox Co. first established its factory in Hoboken about five years ago and about two years ago moved the Wheatland, Pa., plant to Hoboken. About 1,000 persons are now employed in the Blaw-Knox shops.

Method of Breaking up Asphalt Pavement With Tractor and Rooter Plow

By LOUIS A. WILSON*

The Marion County Construction Co., recently had a contract for resurfacing Market St., Indianapolis, Ind., in which was involved the removal of the existing asphalt pavement. To tear up this asphalt the contractors decided to use a motor truck and a rooter plow. However, progress was not as rapid as desired and a few days later the contractors accepted the loan of a 5-ton Caterpillar tractor from Timberlake Machan Co., distributors for this tractor in the Indianapolis territory.

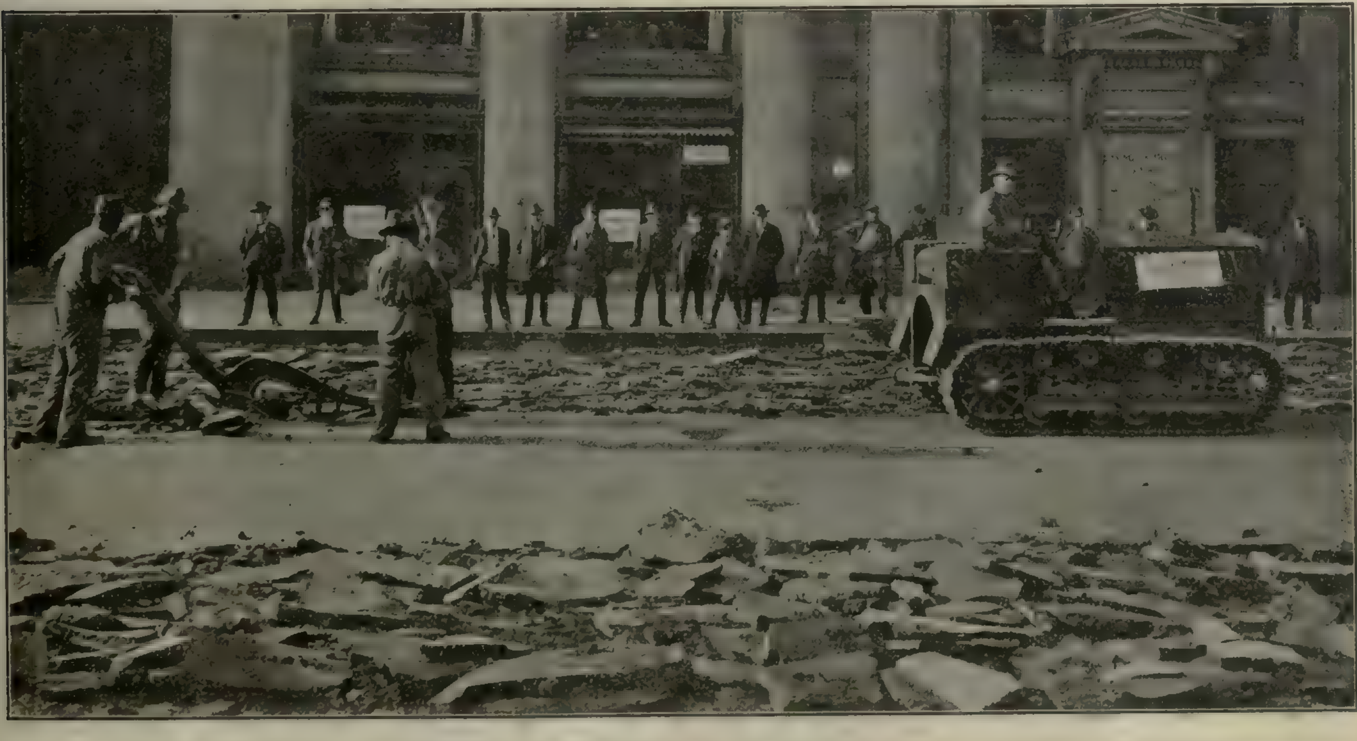
In three hours after starting the work, the Caterpillar finished the job of tearing up the pavement by ripping out 1,300 sq. yd. of asphalt. As shown in the accompanying illustration, 1 man was required to operate the tractor and 4 men to operate the plow. An anaylsis of the cost of labor and tractor operating cost, including interest on investment, depreciation, fuel, etc., and labor at 50 ct. per hour, showed a unit cost for the work of 1.1 ct. per sq. yd. or approximately $14 for the total cost of tearing up one city block of asphalt pavement.

Thew Shovel Co. and Thew Automatic Shovel Co. Merge

The Thew Shovel Co. and the Thew Automatic Shovel Co., of Lorain, O., have combined, the Thew Shovel Co. taking over the business and assets of the other concern. The officers of the new company are: President, F. A. Smythe; Vice Presidents, H. H. Harris and A. B. Taylor; Secretary, C. B. Smythe; Treasurer, R. B. Miller; Sales Manager, H. E. Billington; Purchasing Agent, H. B. Newtown.

Baltimore Plant of U. S. Asphalt Refining Company Damaged by Fire

The Baltimore, Md., plant of the United States Asphalt Refining Co. was damaged by fire on the afternoon of July 19. The fire was caused by lightning striking a storage tank containing crude oil. While considerable damage was done to the plant, besides the burning of three tanks of oil and the laboratory, the major parts of the refinery and the oil in storage were saved. Operations and shipments were suspended for about ten days.



HOLT CATERPILLAR TRACTOR AND ROOTER PLOW BREAKING UP ASPHALT PAVEMENT

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*Holt Mfg. Co., Peoria, Ill.

MEETINGS

Calendar of Coming Meetings

Aug. 10-12.—American Society of Civil Engineers.—Fiftieth annual convention, Portland, Ore. Secretary, Charles Warren Hunt, 29 West 39th St., New York, N. Y.

August 24-26.—League of Cities of the Third Class in Pennsylvania.—Annual Convention, York, Pa. Secretary, Fred H. Gates, City Clerk, Wilkes-Barre, Pa.

Aug. 25-27.—Union of Nova Scotia Municipalities.—Annual Convention, Windsor, N. S., Canada. Secretary, Arthur Roberts, Town Solicitor, Bridgewater, N. S.

Sept. 1-3.—Michigan State Good Roads Association.—Annual Meeting, Lansing, Mich. President, P. T. Colgrove, Hastings, Mich.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

PERSONAL MENTION

L. Mitchell has resigned as city manager of Lufkin, Texas.

W. G. Gordon has resigned as town engineer of Oshawa, Ont.

John Berg has been appointed state engineer of South Dakota.

Homer M. Derr has resigned as state engineer of South Dakota.

B. E. Mooney has been appointed city engineer of Whitefish, Mont.

G. A. Russell has been appointed engineer of Geary County, Kansas.

D. M. Earle has been appointed city engineer of Worcester, Mass.

X. A. Kramer has resigned as state highway engineer of Mississippi.

R. L. Richards has resigned as engineer of Douglas County, Washington.

F. H. Murray has resigned as state highway engineer of South Carolina.

H. C. Dietzer has been appointed state highway engineer of Mississippi.

George Borck has been appointed road engineer of Ottawa County, Michigan.

Alfred McKee was recently appointed bridge engineer of Polk County, Iowa.

H. G. Bleeker has resigned as superintendent of roads for Hastings County, Ontario.

Peter McLaren has been appointed assistant superintendent of roads of Hastings County, Ontario.

Simeon Fox has succeeded H. G. Bleeker as superintendent of roads of Hastings County, Ontario.

M. M. Buck has resigned as road engineer of Ottawa County, Michigan, and will engage in private practice.

PUBLICATIONS

LOUISIANA, REPORT OF STATE HIGHWAY ENGINEER, From April 20, 1918 to April 20, 1920. Paper, 6x9 in,. 134 pages and covers. Illustrated.

In the first section of this report is given a short history of the Highway Department of the Board of State Engineers, following which are statistical tables of highway work. Next the work of the Highway Department for the two years covered by this report, is taken up, accompanied by tables showing the status of finances and road work. Appendix A comprises tabular statements relative to location, lengths, character and cost of highway work undertaken by the Highway Department during the period embraced in the report, and Appendix B consists of a resume of the operations of the Highway Department by parishes, and contains data relative to past and proposed activities.

CALIFORNIA HIGHWAYS. A Descriptive Record of Road Development by the State and by Such Counties as Have Paved Highways. By Ben Blow, Mgr., Good Roads Bureau, California State Automobile Association. H. S. Crocker & Co., San Francisco, Cal. Cloth, 6x9 in., 308 pages. Illustrated.

The purpose of the author of this book, who has for many years been identified with the good roads movement in California, is to "tell what has been done in California as to the development of state and county highway systems, to picture how the present movement came into such a tremendous swing." The work of the State Highway Department, with detailed information on the movement for good roads, is given in the first section of the book. Road development in the seven highway divisions of the state and brief outlines of the 64 state highway routes are dealt with in the second section of the book. The third part of the book, consisting of 27 chapters, takes up severally "California's Good Roads Counties," outlining the road development in each. Illustrations are distributed copiously throughout the book, and the many 1 and 2-page maps, together with a large map of state highways inserted in the back, add to the interest and value of the work.

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Dust Preventives & Road Binders

By PREVOST HUBBARD

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JAMESTOWN, N. Y., AUGUST 11, 1920

Number 6

Bridge Construction in Nebraska

Need for Stronger Bridges Demonstrated by Failures of Existing Structures Under Heavy Trucks—Brief Descriptions of Bridges Completed and Under Construction in Scotts Bluff County, Nebraska

The advent of the passenger automobile demonstrated the inability of unsurfaced roads and roads of the cheaper types of construction to withstand a greatly increased and heavier traffic; the development of the motor truck as a vital factor in our transportation system has shown the need for not only a higher type of road, but also a higher type of bridge. Bridges built to sustain a horse-drawn load of a few tons have been able, for the most part, to sustain the loads imposed upon them by passenger automobiles but the not infrequent failures, often with fatal results, ensuing from the use by motor trucks of structures designed for the traffic of a decade ago, presage the general movement for heavier bridge structures throughout the country. Bridge development must be kept abreast with highway development.

That the necessity for more and better bridges is being fast realized is evidenced by the bridge work in Nebraska. In 1919 there were five state aid bridges completed in that state at a total cost of $230,991.94. Contracts for five state aid bridges were let in the same year at an estimated cost of $494,473, these structures to be completed this year.

Plans for 25 county bridges have been approved to date and construction has commenced or will be under way in a short time. Most of these bridges will be constructed of reinforced concrete. They will consist of from 3 to 9 spans and range from 50 to 150 ft. in length.

In Scotts Bluff County in the western part of the state four reinforced concrete arch bridges are being built across the Platte River, located at Minatare, Scottsbluff, Morrill and Henry. The first three consist of twelve 50-ft. spans, while the bridge at Henry, because of an island in the center of the stream, consists of two sections of six 50-ft. spans.

The Minatare Bridge, situated between Minatare and Melbeta, will be opened to traffic in a short time. One of the accompanying illustrations shows the reinforcement in one of the piers of this bridge. The other illustration shows the arch forms and the construction track at the side.

The construction of all four bridges over the Platte

Reinforcement at Pier

Forms in Place

MINATARE BRIDGE, OVER THE PLATTE RIVER, SCOTTS BLUFF COUNTY, NEBRASKA

River is carried on by the same method. A ½-yd. concrete mixing plant is erected and a trestle is constructed longitudinally with the bridge, with a track on top for the concrete cars and a lower track to carry stripped forms and lumber ahead. The upper track is also used for the same purpose and a short boom is attached to the concrete car and the panel forms on the spandrel walls are quickly unbolted and moved ahead. In the stripping of arch and spandrel forms a motor truck, with a boom similar to that used on the concrete car, is run out.

The total length of these four bridges in Scotts-Bluff County is 2,712 ft. The total amount of concrete required is 5,298 cu. yd., and the total fill amounts to 47,000 cu. yd.

The cost of the bridges is paid from $160,000 in bonds voted by Scotts Bluff County and $25,000 is furnished from the state aid bridge fund.

W. J. Armstrong is in charge as state bridge inspector.

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Organization of a Provincial Highway Department*

By A. E. FOREMAN†

You are all familiar with the remarkable increase that has taken place in the number of motor vehicles used during the past few years and there is every indication that this development will continue for some considerable time.

It is also apparent that this method of locomotion and transportation will demand a more substantial and more expensive type of highway and a more extensive program for highway improvement than have obtained in the past.

This fact is recognized in the United States, where it is estimated that during the next five years some $3,000,000,000 of dollars will be spent upon highway construction, or in other words, nearly four times as much as was expended on railroad construction during the record five years of railroad development in that country.

In Canada we too have passed the peak of railroad construction and are now at the dawn of a new era of highway construction and improvement.

That those in authority in Canada are fully cognizant of the importance of providing large sums for the improvement of our highways to take care of this speedier, heavier and more destructive type of traffic is indicated by the action of the Federal Government in passing the "Canada Highways Act" at the last session of the House, providing for assistance to the provinces for their main roads to the extent of $20,000,000 extending over a period of five years. Ontario has a highway program that will involve an expenditure of $60,000,000 during the next five years. British Columbia, with a population of a little more than half that of the city of Montreal, has voted for expenditure on roads and bridges this year over $3,500,000 or $9.00 per capita, and in addition has authorized the borrowing of a further sum of $5,000,000 for construction and improvement of the main highways during the next three or four years, and these sums do not include expenditures that will be made by municipalities or federal assistance under the "Canada Highways Act."

I quote these figures to show that the need for more and better highways is not only recognized, but what is more important, that millions of dollars have actually been voted for highway improvements. It is my opinion, Mr. Chairman, and I believe I am voicing the sentiments of those present, when I say that it is equally and as vitally important that there should be well organized and efficient highway departments to insure the spending of these large sums so as to obtain a maximum amount of service at a minimum of cost.

It is not going to encourage the taxpayers of the country to vote further sums—and much larger amounts will certainly be required for highway improvements in the near future—if the moneys already voted are unprofitably spent through incompetency, lack of organization, or any other cause, and it is with this highly important question of the organization of provincial highway departments that I wish to deal.

When we have a large and expensive work to undertake, whether it be construction work or manufacturing, there are three primary essentials that must be considered:

First, we must decide upon the most suitable type of machinery for the work in hand.

Second, we must procure the most economical power available to operate the machinery.

Third, we must place an experienced mechanic in charge and see that all the parts are kept in the best working order and properly oiled so as to reduce the friction to a minimum and enable it to be operated as efficiently as possible.

Similar factors enter into the formation of a provincial highway department.

First, we must decide upon the type of organization that will give the best results.

Second, we must procure the most efficient motive power available to energize the organization and this is represented by the personnel of the staff.

Third, having the organization and a competent staff, we must see that every individual unit is in the best and most efficient working order by keeping him systematically in touch with the latest highway engineering practice, and reduce the friction to a minimum by engineering a spirit of cooperation and esprit de corps among the members of the staff that will cause the organization to function smoothly and effectively.

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*Extracts from a paper presented at the seventh annual convention of the Canadian Good Roads Association, Winnipeg, Man., June 1-3, 1920.

†Public Works Engineer, Department of Public Works of British Columbia.

And the engineer in charge must not only have experience, tact and executive ability, but he must be an enthusiast and be able to inspire enthusiasm in others, as the spirit and activity of the organization depend largely upon his initiative and example.

* * * * *

Now with reference to the second factor—the energy of the organization—the staff.

The success of the department depends very largely upon the personnel of the staff. A government should endeavor to secure the services of the most competent and experienced engineers available, and I may say that in addition to technical knowledge and experience, tact and sound judgment or good horse sense are important and essential in government service.

A clerk in a store may know his business thoroughly and he may be a hard and conscientious worker, but if his manner estranges and drives away customers then he is not a satisfactory man for the position and the same argument applies to an engineer on government work who may have the other necessary qualifications but lacks tact. In fact, I believe a successful engineer on government work —and I emphasize the word successful—requires more attributes than are necessary to fill a position of similar responsibility with a private corporation, and to procure men of this calibre a government must be prepared to do two things:

First, make appointments purely on the basis of qualifications and fitness; and

Second, pay equitable remuneration for services rendered.

All vacancies in the higher positions should, where possible, be filled by promotion from within the service and such promotions should be based on merit and not on seniority. Failure in this respect will seriously affect the spirit and efficiency of an organization. It will not only discourage good men in the service, but it will deter the desirable type of man from entering the service.

Engineers should be employed who can inspire the confidence of the general public, men of firmness who will report adversely upon a request for work which is not warranted, no matter by whom the request is made, and do so with such fairness, tact and judgment that they will retain the confidence of their chief and of the general public, and when possible the good will of the applicant. Such men are none too plentiful, but where a government is spending large sums of public money it should be prepared to take the step necessary to secure and retain the services of men of the right calibre.

Qualified engineers will save their salaries many many times over and I shall give you an illustration. This is [showing diagram] part of the profile of the North Francois Lake Road, which is the main road into the Francois and Cotsa Lake country from the G. T. P. The road is 15 mi. long and runs through a somewhat barren section, but connects a large and rich area with the nearest railroad station. The road as laid out some years ago was located by the local foreman under the supervision of the road superintendent, and the profile of a part of the road is shown by the black line. The grade, alignment and road material were so poor that two years ago it was decided to relocate all but 2 mi. of the 15, and the red line shows the profile of the corresponding section of the new road. The difference in grades is apparent. The new road is on a better alignment and over more suitable road building material; it is free from gumbo, has a southerly exposure and is actually some 700 ft. shorter than the old one. When the old road was built the cost was not segregated and the original cost cannot be obtained, but today the old road would cost over $60,000 to build, or about $10,000 more than the new one, and now has to be abandoned. The traffic over the road can be closely estimated from the records kept on the ferry at Francois Lake, and it is estimated that owing to improved grades, etc., the saving on the tonnage hauled over the road last year would be over $19,000 which, capitalized at 6%, would roughly amount to $300,000. And the traffic will increase very rapidly and become very heavy as the settlers are just commencing to go into that district.

I could quote many other instances where experienced engineers and a proper organization would have saved in the aggregate hundreds of thousands of dollars, and the importance of engaging competent men cannot be too strongly emphasized. This applies not only to the district and assistant engineers, but to local foremen and other employees of the department.

Now thirdly to keep the organization working smoothly, effectively and without friction, there are two factors that have to be considered:

First, it is necessary to keep the engineers in touch with the latest engineering practice in highway work by means of literature, etc.

Second, it is necessary to arouse in them an interest in, and enthusiasm for, their work, by creating a camaradarie among the members of the staff and by making each one feel that he is an important unit of an active, progressive and up-to-date organization.

With regard to the former, all the engineers should be provided with the best and latest literature on road work. Arrangements should be made with provincial libraries whereby standard technical books may be loaned to any of the district and assistant engineers when required in connection with any special work they are doing. They should also be placed on the mailing list for such publications as those issued by the office of Public Roads of the U. S. Department of Argiculture and similar bulletins, and special articles in technical journals should be called to their attention, or copies supplied to them.

Again, when possible, they should be given every opportunity of seeing actual construction work carried on, for example, the laying of concrete roads, in which the methods are continually being improved.

Interest may be accomplished, among other means, by holding annual conferences of the engineering staff. Every member should take an active part in the conference by preparing either a paper, or a discussion on some work which he has been doing. The program should be drawn up well in advance so that every engineer may come fully prepared. The very fact of his having to prepare information to place before other experienced engineers will cause him to use every care in securing his data, give him a more thorough grasp of the details and cause him to take greater interest in his work. The results obtained by bringing the men together and giving the opportunity of exchanging ideas and the inspiration derived from such a meeting will be most beneficial and will add greatly to the efficiency of the men and of the department.

Last spring one of our general foremen in eastern British Columbia was so interested in the program of the engineering conference that he wrote for permission to attend the conference, stating that he would be willing to take his holidays at that time and pay his own expenses.

One of the assistant engineers in the interior where they have no hard-surfaced highways arranged to take his holidays at the coast during paving operations so as to gain experience on this class of work. And when this spirit is in evidence, Mr. Chairman, the best of results should follow.

In order that the fullest benefit may be derived from such annual conferences and that the good work initiated may be sustained, special committees should be appointed to deal respectively with road, bridge and ferry matters. Each committee should be under a responsible chairman whose duty it would be to keep in touch with the members thereof, circulate suggestions for improvements in methods of design and carrying out of work, and finally to submit concrete data to the chief engineer for his approval. If properly followed out, much splendid work can be accomplished, particularly in providing specifications, plans and forms which are likely to meet general requirements.

Cooperation should be the keynote of the department. There should not only be cooperation among the different members of the staff, but cooperation with other departments of the government and with the general public. You can well afford to dispense with the services of even a capable man if he refuses to cooperate. He is a misfit and has the same effect upon the organizatiaon as sand upon the bearings of a machine.

Monthly meetings of the heads of the different branches at headquarters for suggestions for improvements and for constructive criticism are valuable in creating the best departmental organization, upon the efficiency of which so largely depends the successful working of the service inside and outside. Every member of the staff and every employee of the department should be encouraged to make any suggestions that he or she considers would improve the service.

There should be close cooperation between the department and municipalities, and the district and assistant engineers should be encouraged to cooperate with responsible public bodies, such as boards of trade, farmers' institutes, and good roads associations, but they should not deal with partisan or political association, as such. The latter should communicate with their members or the minister direct. When you attempt to mix the two ingredients, business and politics, in the department, the combination certainly does not give efficiency. There should be a clear line of demarcation between the administrative and the legislative, and to accomplish this harmoniously takes tact.

And finally there should be close cooperation between the highway departments of the different provinces, so that they can be of mutual assistance and each benefit by the experience of the others. This could possibly be best attained through the medium of the Canada Highway Branch of the Federal Department of Railways and Canals, which could act as a central bureau for collecting and distributing information.

And here I would venture the suggestion that a monthly bulletin be inaugurated by the federal authorities in which would be published the more important highway problems common to each province Such a publication could be an excellent medium for disseminating useful information, in addition to keeping the different provinces in touch with what is being done in the other provinces. In this matter we could well afford to follow the lead of the United States Bureau of Public Roads.

In summing up, Mr. Chairman, I believe that if we introduce a proper system of organization; employ only the best qualified men available; keep them efficient and enthusiastic by means of systematic education and cooperation, and discourage outside interference, the money will be spent wisely and honestly. And when the people are convinced that such is the case, I have no doubt that they will furnish unstintingly the large sums of money which are and will be so urgently required for the improvement of our highways.

The Education of the Highway Engineer*

By BRIG.-GEN. C. H. MITCHELL†

The development of our highways has acquired such prominence that they are now amongst our most important public utilities. With the greatly increased activity in the construction of our highway systems, whether municipal, provincial or national, we find ourselves examining into our preparation and our facilities for the carrying on of these highly necessary and important undertakings. In this preparation we are beginning to realize that provision for adequate engineering, with its many branches, stands much in need of attention from all of us who are concerned in these utilities; and we realize that if we are to proceed along sound lines for the development of our highways we must be assured that a sufficiently large number of trained engineers of the several types required are forthcoming to carry on the work in its various phases. Too much importance cannot be attached to the quality and training of those who are to be intrusted with the engineering of our highways.

As we look forward to the future of highway engineering for the next decade, or more, we can see that there will be a very considerable demand from all parts of the country for engineers trained in these various branches and when the diversified forms of engineering are considered we realize at once that the field to be supplied is larger than at first appears.

There was a time not many years ago—and most of us can remember it—when in regard to policy, construction and financial aspect, our highway undertakings were altogether different from those of today. In those days it was thought that but a small portion of the work lay within the province of the engineer and as a consequence but few engineers were engaged in highway work. But this has changed. The development of province-wide programs of road building, the demand for permanent roads of a high class, the employment of materials of road construction as various as the regions in which roads are built, the inclusion in every project of numerous interconnected problems of engineering concerned with other public works and the introduction of motor transport on a scale hitherto unthought of, have all brought about increasing demands for technically trained men—whether we call them highway engineers or not—who are thoroughly essential not only to the construction of good roads but to their efficient and economical maintenance.

To those actually engaged in the larger construction of our highways in our municipal, provincial and national program, the necessity for wide experience on the part of their engineers must be increasingly apparent and it is more than ever essential that their particular fitness for the various special branches of engineering should be assured.

The diversity of these various branches or special kinds of engineering which are now included in, or necessary to, the broad subject of road building is not fully appreciated by the public nor, indeed, by but a few of those outside of the technical services, engaged in the work itself. There was a time when a road or highway was just the roadway itself, so far as engineering is concerned, and it was treated in this light and roads were built or grew and were maintained if at all with the employment of the simple engineering methods or the application of but the most elementary principles of applied science. But nowadays, like all other similar undertakings, the complexity of today's requirements and life has laid a much greater burden on those who are charged with the carrying out of the technical side of highway construction.

For instance, we naturally think of highway work as a branch of the broad subject of civil engineering, and so it is. But when one considers at length the various features involved, not only in the actual road building but the closely related problems which accompany it, it is found that, as an engineering question, the so-called specialty embraces many features of other branches of engineering, such as mechanical, chemical and even electrical, with all of which the well informed and broadly trained highway engineer should have no small acquaintance.

It is not sufficient that the civil engineer engaged in highway construction should have good experience and ability in land survey work, topography, cross-sectioning or mapping, or skill in the location and the balancing and computation of quantities involved in excavations and embankments or in grades and drainage or in foundations, or aptitude for the patient and laborious attention to office detail which goes with a well organized engineering staff. But he must have also a degree of experience—perhaps even to the degree of being an expert—in the design and construction of steel and concrete bridges and culverts, retaining walls and those many concrete structures incidental to roads of all classes. To consider the subject broadly he must be also a student of meteorology and understand the climatic conditions and their effects and he must know something of geology and even of petrology where concerned with the qualities of road metals. If he is concerned with paving and roads and streets in closely settled areas he has a highly specialized field before him in the study of the sources, properties, preparation, construction, behavior and maintenance of all kinds of paving materials from gravel and stone to wood and asphalt. But that is not all, for he must be prepared at all times, when building such roads and streets, to deal with the continuously occurring problems involved in taking care of water pipes and sewers, of street railway tracks, or railway crossings and their protection and operation and of the increasingly difficult electric line crossings, whether telegraph, telephone or high tension electric power lines.

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*Paper presented at the 7th annual convention of the Canadian Good Roads Association, Winnipeg, Man., June 1-3, 1920.

†Dean of the Faculty of Applied Science and Engineering, University of Toronto.

But the engineer in this work, if he is to be really up to it, must be more than a civil engineer, for, as pointed out, he must have a knowledge of mechanical and electrical and chemical work as well following present day progress. Not only must he be conversant with the underlying principles of traction, but he must have a practical working knowledge of the mechanical and electrical machinery and equipment used in the processes of manufacture and preparation of materials and in the construction of roads. The varieties of such equipment—those for instance for handling materials in excavation, quarries, sand and gravel pits, and in the preparation of them by crushers and screens, or the machinery used in construction, such as concrete mixers, road rollers, asphalt, tar and similar plants—are in themselves such important factors in road building as to demand close attention and knowledge on the part of the engineers. But there is the other phase of the mechanical engineering of which the road engineer of today must have more than a passing knowledge. He must know the various principles of operation and control of motor transport of all kinds, from the touring motor car to the freight lorry, and their effect upon his roads in all seasons. He must also keep up with the activities of the manufacturers of today —with the rapidly changing types of steam, oil and electric vehicles.

The coordination necessary for electrical work in connection with streets and highways has already been indicated as to line crossings but it is no small matter in congested areas to deal with the complicated problems of electrical conduits in the roadbed, overhead wires, electric lighting arrangements and the vexing questions of electric railways and their maintenance with regard to the roadbed.

So with the chemical side of the work: There must be for the future a larger proportion of these engineers with a knowledge of the chemical properties of the various soils and materials of road construction and of the chemical processes involved in securing, preparing and applying in construction, the various special constituents of tar, asphalt and other materials.

Another feature, which in this new country is now very properly claiming attention in highway construction, is that concerned with the strategical planning of routes, either municipal or provincial, and the work of general design related to the broad principles of town planning. Much is to be made and is being made of this feature and it is very desirable that the coming engineering generation should make it a part of its work of preparation. In doing this they should not lose sight of the artistic and aesthetic in their work of street arrangement and beautifying, in their boulevards and parkways, and even in the long reaches of rural highways which are so attractive a feature in the roads of England and France, of which the soldiers in the war have pleasant memories.

But engineering and technical knowledge and experience are not all that the successful highway engineer of today and tomorrow will require. These will form only part of his professional equipment. He must be much more than a technical man. The nature of this work requires other knowledge and qualifications. He must have administrative ability; be must have vision, judgment and tact; and those most vital qualities which will enable him to deal with and cooperate with other men, whether workmen or employees, foremen or contractors, sales agents or walking delegates, business men, ratepayers or politicians. For after all, the business of the building and maintaining of highways today is largely business—administrative work with engineering closely mixed with it and as we go on in our complex methods of doing things the business and the engineering will become more interconnected and inseparable.

The highway engineer must, therefore, be an administrator, an economist and a cooperator with the business man, the legislator and the ratepayer. It is perhaps this part of his work which will make him the more valuable servant of the municipality or the state, but he will acquire that value only in so far as he can efficiently combine his engineering knowledge and experience with his administrative ability.

Now how are we going to secure these engineers? It will be said that we ask for a super-engineer in this highly detailed specification of all he must be able to do. But why not? Is not our highway engineering going to be amongst the most important in the development of this country? We must then be prepared to meet the demand, and all those concerned in securing good engineers are equally responsible in the interests of good roads and highways.

The responsibility lies not so much on schools, colleges or univertities as upon the municipalities and the governments that are building roads and highways. True, the colleges and universities must give the fundamental education, but it is quite evident that the further or later education must progress in successive stages in the field, on the actual construction or in the engineering or administrative offices of the highways departments or commissions of the country.

The place of the college or university in this educative process is however well defined and the work

(Continued on page 73)

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THE SCOPE OF HIGHWAY ENGINEERING

If the designation "highway engineer" means anything at all to the average layman, it serves to distinguish from the gang of laborers the man wearing rough clothes and a white collar (sometimes) who does mysterious things with a telescope on three legs or walks about the job with a notebook. This is not to be wondered at, perhaps, since the public sees only the field work and takes little notice of the construction except to complain of the length of time a detour has to be used. The highway engineer would be better appreciated if the public which employs him understood how much of an engineer he has to be—how many things are included among those of which he must have knowledge.

"The diversity of these various branches or special kinds of engineering which are now included in, or necessary to, the broad subject of road building is not fully appreciated by the public nor, indeed, by but a few of those outside of the technical services, engaged in the work itself," according to General Mitchell, of the University of Toronto, the author of a paper printed on other pages of this issue. He then notes some of the subjects on which the highway engineer must be informed, pointing out how highway engineering involves various branches of civil, mechanical, and even electrical, engineering.

And it must be remembered that these are only the technical requirements and that, in addition to them, the successful highway engineer must have many other qualifications. He must be an executive; he must be a business man; he must know how to meet and deal with other men.

Much, if not all of the layman's lack of appreciation of the engineer—highway engineer or other specialist—is the fault of the engineer himself. The average engineer does not put himself forward sufficiently. He is content, apparently, to do his work and draw his meager pay and let someone else take the credit. It is quite time that highway engineers took steps to bring themselves and their work before the public in the right way.

TACT AS A QUALIFICATION OF THE ENGINEER

Tact, defined by Webster as the "peculiar ability to deal with others without giving offense," is one of the chief requisites of success in most callings. It is essential to the professional engineer and to the engineer in public service and is an asset of value to the engineer in almost any position in any kind of work. Its necessity to the engineer in government service is emphasized in a paper by A. E. Foreman, Public Works Engineer of British Columbia, which is printed elsewhere in this issue.

But in spite of its necessity to his success, tact is one of the qualifications most often lacking in the average engineer's equipment for his job.

This condition is partly the result of the kind of preparation the average engineer obtains. The curriculum of an engineering school is necessarily crowded with technical studies, to the exclusion of those cultural subjects aptly designated as the "humanities." All of the student's time is taken up by the study of things; none is given to the study of people. He is taught how to design, but not how to organize; how to plan, but not how to execute. There is little, if anything, in his schooling from which he can learn how to handle men or how to market his knowledge.

This is no way derogatory to the technical schools. They accomplish all that can rightfully be expected of them, in view of the compartively short time aloted for the performance of their work.

The engineer's lack of tact is also partly due to the circumstances of his usual employment, in which he seldom comes into direct contact with the public. The average engineer, unlike the so-called professional man, is generally a salaried employee. In the regular course of his work he does not come into contact with the people, but reports to an executive or to another engineer. Tact is useful even in such relations, but not so necessary as it would be in dealing directly with the different people upon whose work he is engaged. The consequence of his comparatively isolated position is that he does not develop tact and the ability to meet other men, as does the worker whose livelihood depends not only upon his skill and ability in his profession but also upon his ability to sell his services.

But however great the handicap imposed upon the engineer by the lack of the requisite training and the absence of opportunity to develop tact, it is not one that he can not overcome if he will. He can interest himself in the affairs of his town or his neighborhood. He can make the most of the limited opportunities that come to him in his daily work and he can make opportunities, both in his work and outside of it. He can take active part in engineering societies, alumni associations and other organizations of which he may be a member or which he may join. He can often enter local politics. All these things will help him, and by doing them he will also serve the community—a civic duty that engineers are all too prone to neglect.

California Will Vote on Proposal to Raise Highway Bond Interest Rate

The proposed amendments to the constitution and highway law of California raising the interest rate on the unsold part of the $40,000,000 state bond issue will be voted upon at the fall election. Petitions with a sufficient number of signatures to make such action possible were filed on July 16. The raising of the interest rate will permit the sale of the bonds at par.

New Jersey State Highway Commission Confirmed

Fails to Confirm Appointment of George L. Burton—Salary of New State Highway Engineer Wasser Will Be $10,000 a Year

In the special session of the New Jersey Senate, the appointments of all members of the new highway commission made by Governor Edwards, were confirmed with the exception of George L. Burton, who was holding the office of chairman of the new body, pending confirmation. On July 27 the Senate went into executive session for consideration of the appointments, and after discussion lasting several hours, the decision was reached. The Republicans were, in general, opposed to all appointees, while the Democrats stood solidly behind the Governor.

On July 28, the day following confirmation of appointments, the commission held its first business session at the State House, Trenton. In view of the fact that George L. Burton was not confirmed by the senate, William J. Kirby was named as temporary chairman of the commission. Thomas J. Wasser, former county Engineer of Hudson County, appointed state highway engineer by the commission about a month ago, will receive a salary of $10,000 per year.

Highway Fatalities in New York State

Deaths resulting from highway accidents in New York State reached the record total of 205 for the month of July, according to the monthly report of the National Highways Protective Society. This number is an increase of 12 over the deaths in June.

Motor vehicles in the City of New York caused the death of 72 people, street railway cars killed 13 persons and wagons 2. In the rest of the state, motor vehicles caused the death of 97 people, street railway cars 6 and wagons 3. Twelve persons were killed at railroad crossings.

Essex County, New Jersey, Will Collect Overdue Assessments from Towns

The county counsel of Essex County, N. J., has been directed by the Finance Committee of the Board of Freeholders to enforce the collection of $116,348 overdue from municipalities in special assessments on road improvements. Some of the assessments date back ten years.

The amounts held to be due from the municipalities and the improvements in which they were incurred are as follows:

Newark, $694.74, Elizabeth Ave., Wall St. and Stuyvesant Ave.; Bloomfield, $39,605.16, Bloomfield and Franklin Aves.; Belleville, $27,878.69, Union, Washington, Bloomfield and Franklin Aves.; West Orange, $6,064.93, Wyoming, Gregory and Eagle Rock Aves., Pleasant Valley Way and Northfield Road; Cedar Grove, $15,209.59, Fairview and Normal Aves., Lindsley and Little Falls Roads; Livingston, $1,511.90, Eagle Rock, Mt. Pleasant, Roseland and South Orange Aves.; Caldwell, $1,240.42, special road taxes and Mountain Ave.; Verona, $14,839.57, Blloomfield Ave.; Irvington, $9,303.06, Lyons Ave.

Highway Traffic in Pennsylvania

A traffic census taken on sections of the Lincoln and William Penn Highways in Pennsylvania on Sunday and Monday, July 25 and 26, showed a count of 32,531 vehicles of all kinds at ten points on the Lincoln Highway and 8,077 vehicles on three sections of the William Penn Highway.

The heaviest traffic was found to be traveling over the Chester County section of the Lincoln Highway, between Coatesville and Downingtown. On Sunday, July 25, there were counted 3,877 passenger cars on this thoroughfare, while the number of trucks was 82. On the following day, Monday, the number of passenger cars fell to 2,307, while the number of trucks jumped to 1,013. On Sunday, 125 motorcycles passed over this road, and 43 on Monday. There were 33 team on Sunday and 74 on the following day. The total number of vehicles on this road for the two days was 7,554.

The heaviest traffic on the William Penn Highway was on the section in Northampton County between Bethlehem and Easton. On Sunday, July 25, the passenger cars using this highway totaled 3,243 and the trucks 75. On the following day 1,002 passenger cars and 270 trucks were counted. On Sunday there were 159 motorcycles and 8 teams and on Monday there were 60 motorcycles and 25 teams. The total number of vehicles on this section for the two days was 4,842.

The count for both highways on the two days showed a total of 40,608 vehicles of all classes, as follows: Passenger cars, 34,165; trucks, 3,780; motorcycles, 1,863; teams, 800.

Highway Work in Ontario, Canada

Plans now under consideration call for the employment of 3,000 men as soon as the harvest is over, on the 1,800 mi. of designated provincial highways in Ontario, Canada. About twenty engineers have been alreay appointed to supervise various sections and preliminary surveys of material are being made.

Ontario will spend about $5,000,000 for road work this year and the Department of Public Works is preparing a plan which will call for the expenditure of $185,000,000 for highway construction during the next five years.

Pennsylvania Weighs Trucks for Overloading

Inspectors of the automobile division of the Pennsylvania State Highway Department have been provided with lodometers, or jack scales, and are carrying on an active campaign against overloading of motor trucks in that state.

When a passing truck is suspected of carrying a larger load than permitted by law, the driver is stopped and two lodometers are placed under the rear axle, which is jacked up by the devices. The dials of the lodometers register the weight on the rear end of the truck. The weight on the front end is secured in a similar manner. If the total weight shown by the lodometers is greater than that allowed by law for the vehicle, the inspectors take the truck and driver to the nearest platform scales to secure an accurate weight.

Within the past few weeks a number of arrests have been made and fine ranging, with costs, from $25 to $100 have been imposed. The fine goes to the municipality in which the arrest is made.

The Education of the Highway Engineer

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it is called upon to do is in a large measure common not only to all classes of engineers destined to be employed on highway work, but common as well to all sections of the country from coast to coast where this kind of work is being carried on.

The fundamental principles of applied science in respect to road building are the same everywhere, and colleges can deal with all of the underlying principles already outlined under the various civil, mechanical and other branches of engineering. It has been said that road building is an art rather than a science. That may have been true in the earlier days and even within our own memories, but it cannot apply today. The work that has been and is being carried out in the universities of Europe and America shows conclusively that scientific training is today a very large factor in successful road building. In the work of research the university has a special service to render to the state and it will be found that as time goes on and the problems of road building and maintenance and of road operation and traffic becme more complicated the processes of experiment and research in which the universities can participate will be more than ever valuable to the road builder.

It is not the purpose here to enter into a discussion in detail of the form such college training should assume or to lay down a special curriculum for highway engineering. All the colleges and provincial universities of Canada are now giving such courses as will supply the coming highway engineer with more or less of the scientific side of his fundamental education. It is desirable, however, that more attention should perhaps be paid to some of those features of the more direct application of principles to road building and maintenance. In this connection I desire to bespeak a further cooperation between those connected with road building, either in municipal or government relations or those engaged in businesses connected with road materials or construction on the one hand and the universities on the other, so that they may be of some mutual assistance in the coordination of effort and in research work. The laboratories of the universities should be at the disposal of municipality and government for these purposes and it is indeed the duty of the university to assist the state in every way in this respect.

The universities, however, must recognize what is already pointed out—that the education of the engineer of today does not stop at technical work. They must supply the engineering student as well with some of the economical, financial and broader education which at least will fit him to carry on after he gets out into his life work.

When the young graduate leaves his college he must not by any means think himself an engineer, much less a highway engineer. He has much practical experience to get. If he is desirous of follwing highway work it is not necessary that he plunge into it as soon as an opportunity offers. There is much advantage to himself and his subsequent employers if he can get some other coordinating experience, such as, for instance, railway work or general municipal work. Railway work is especially fitting for carrying on with highway work and we are now coming to learn that the engineering work of both is similar and equal in importance with the advantage lying with highway work for diversity.

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EQUIPMENT—TRADE—MATERIALS

Koehring Construction Mixers

A new catalog of concrete mixers has been published by the Koehring Machine Co., of Milwaukee, Wis. It is 8x11 in. in size and contains 96 pages. The various structural elements entering into Koehring mixers are discussed at length, accompanied by pictorial presentation of the points involved. Following this analysis the several models and styles of Koehring mixers are described and illustrated. The catalog contains thorough and comprehensive information on the Koehring line, at the same time directing the attention of the prospective purchaser of mixer equipment to factors of construction which should be investigated in any concrete mixer.

Standard Avenue, Whiting, Indiana

The lack of transportation facilities has been keenly felt since 1914 and there has been a nation-wide resort to the motor truck for relief. That this relief has been found is evidenced in the rapid development of motor transportation, which has become a dominant factor in the transportation system of this country. For short hauls of 100 mi. and less, many producers of commodities rely entirely on the motor truck.

Road building during the past two years has been hampered to no little degree because of the inability to secure shipments of road materials and machinery. And in keeping with the general movement to press the motor truck into service, a large volume of machinery and materials has been transported over the highways so as not to delay the construction of good roads. One case of this nature which merits attention is the transportation of cement by truck in Illinois and Indiana.

Between the Buffington, Ind., plant of the Universad Portland Cement Associatioon and Chicago, Ill., during the month of February, 1920, about 116,000 bbl. of cement, and during the month of March of the same year, about 170 truck loads of cement per day, were hauled. Some of these trucks, as shown in the accompanying illustrations, were loaded with 300 sacks or about 16.5 tons, in addition to the weight of the truck.

The route of these trucks included the city of Whiting, Ind., passing over Standard Avenue for a distance of 2 mi. This street was constructed in 1918 of Stanolind Paving Asphalt B, of penetration 52-55, and is subjected to a normal heavy traffic. The additional unusually heavy traffic has aparently had no unfavorable effect upon this pavement, the construction of which is of interest as showing that properly constructed asphalt pavement is able to stand very severe traffic.

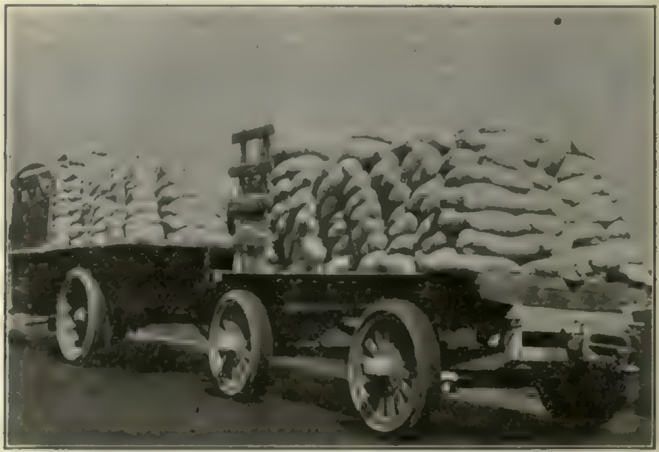
The foundation consists of cement concrete 8 in. in thickness and the binder course was laid 1½ in. in thickness, containing approximately 6% of bitumen, 25% of sand and 69% of broken stone passing a 1-in. screen. The wearing course is 2 in. thick, containing approximately 11% of bitumen, 13% of calcium carbonate passing a 200-mesh screen, and 76 % of sand. As noted above, the asphalt cement used had a penetration of 52-55. The roadway is 30 ft. wide and has a crown of 3 to 4 in.

Asphalt Production in the United States

A preliminary estimate of the production and sale of asphalt and native bitumens and allied substances in the United States in 1919 has just been made public by the United States Geological Survey, Department of the Interior.

The asphalt produced from domestic petroleums amounted to 600,000 short tons, valued at $9,000,000, an apparent increase over 1918 of 72,425 tons and

TRUCK TRAFFIC ON STANDARD AVENUE, WHITING, IND.—ASPHALT PAVEMENT

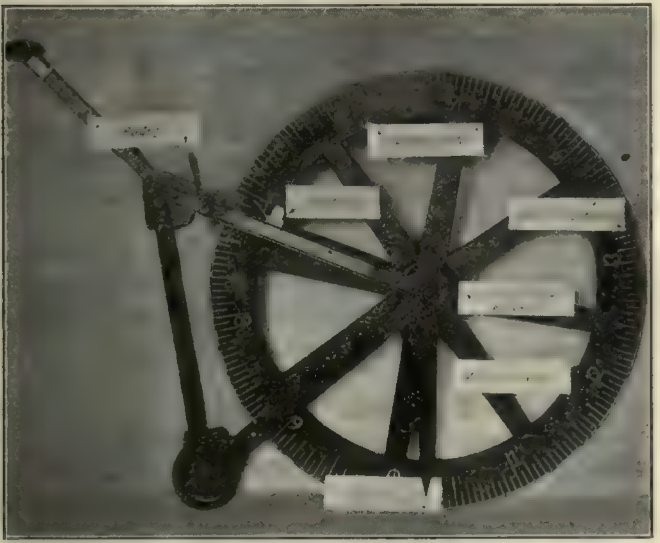


TRUCK AND TRAILER CARRYING SACKS OF CEMENT OVER STANDARD AVENUE

$1,564,796. The asphalt produced from Mexican petroleum amounted to 672,000 short tons, valued at $7,917,000, an increase from 1918 of 21,756 tons and a decrease of $2,407,020 in value. About 115,000 short tons of native bitumens and allied substances valued at $1,000,000 were produced in 1919, an apparent increase over 1918 of 54,966 tons and of $219,192.

Pavement and Track Measuring Device

The Sterling trackometer, shown in the accompanying illustration, is a measuring device used in securing paving yardage and track chainage and for land measurement where the land is level. While designed primarily to be used in securing track chainage, it is used to advantage in pavement computations.



STERLING TRACKOMETER

The device consists of a built-up, hard wood wheel, with an adjustable brass tire having a calibrated circumference of 10 ft. A strip of rubber between the tire and felloe furnishes necessary resilience. The operating handle is so hinged that there is no fulcrum and the wheel can not be lifted from the ground by bearing on the handle. A direct reading counter records the distance traveled and a hand brake permits the locking of the measuring wheel.

Two men constitute the party instead of the usual three. In work on city streets, where a tape is apt to be broken by moving vehicles and the work subjected to considerable interference, the device may be used to advantage.

The device is manufactured by the Warren-Knight Co., of Philadelphia, Pa.

Sand and Gravel Production in 1919

Approximately 60,196,000 short tons of sand and gravel of all grades were sold in the United States during 1919, according to preliminary estimates made by the United States Geological Survey, Department of the Interior. This quantity represents a decrease below that sold in 1918 of about 1,628,000 tons. The value in 1919, however, was $37,819,000, as compared with $37,927,079 in 1918. Producers state that the demand for this material in 1919 was heavy but that production was curtailed on account of car shortage.

J. D. Adams & Co., Indianapolis, Ind., have established branch offices in Dallas, Tex., Minneapolis, Minn. and Kansas City, Mo.

The Parker Motor Truck Co., Milwaukee, Wis., has closed a contract with the Wilson & Verera Corporation, New York, N. Y., which involves the distribution of 2,000 trucks. The Wilson & Verera Corporation is the distributor for this truck in eight of the eastern states and dealers will be appointed in principal cities. Delieveries will start this month.

The Barrett Company has issued a booklet entitled "Special Uses for Tarvia," which describes the use of this paving material in the repair and maintenance of concrete, macadam, bituminous, brick, wood block and gravel roads. The use of Tarvia for shoulders, on plank floors of bridges, gutters and waterways, etc., is also considered. The booklet contains 48 pages, is well illustrated, and presents in an available form methods for the solution of many vexatious small problems which at various times confront the highway engineer.

The Education of the Highway Engineer

(Concluded from page 73)

It is well to keep in mind that so far as the present is concerned, there are many college graduates and other young engineers who have had the advantage of war experience on highway work, in road building and maintenance in France and in motor transport and traffic operation there under difficult conditions.

But the duty of the state is larger than that of the university in this respect of education. All that the university can do is to provide the early fundamental scientific education and but a small portion of the special highway engineering training. The municipality and the state must do the rest if they are to secure the right type of useful highway engineers. They must be prepared to take the young university graduate, or the specially trained or partially scientifically educated school or college boy, and put him into their organizations in such a way that he will learn the other side of the work of the engineer. He must be given every opportunity to learn the practical, administrative and operative portions of the work in successive stages, and only by this means will the state produce for itself broadly educated highway engineers.

MEETINGS

Calendar of Coming Meetings

Aug. 10-12.—American Society of Civil Engineers.—Fiftieth annual convention, Portland, Ore. Secretary, Charles Warren Hunt, 29 West 39th St., New York, N. Y.

August 24-26.—League of Cities of the Third Class in Pennsylvania.—Annual Convention, York, Pa. Secretary, Fred H. Gates, City Clerk, Wilkes-Barre, Pa.

Aug. 25-27.—Union of Nova Scotia Municipalities.—Annual Convention, Windsor, N. S., Canada. Secretary, Arthur Roberts, Town Solicitor, Bridgewater, N. S.

Sept. 1-3.—Michigan State Good Roads Association.—Annual Meeting, Lansing, Mich. President, P. T. Colgrove, Hastings, Mich.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Road Men Form Social Organization

About 60 inspectors and road foremen of the Division of Maintenance of the Pennsylvania State Highway Department met on July 17 in the Adelphia Hotel, Philadelphia, and formed a permanent social and fraternal organization to include the counties of Chester, Delaware and Montgomery.

Major C. E. Meyers, District Engineer with headquarters in Philadelphia, presided. Addresses were made by State Senator T. Larry Eyre, of West Chester, and A. P. Irwin, of Chadd's Ford.

PERSONAL MENTION

J. A. McVittie has been appointed city manager of Richmond, Cal.

R. J. McLelland has resigned as city engineer of Kingston, Ont., Canada.

Frank H. Craven has been appointed director of public works of Philadelphia, Pa.

G. W. Jones has been appointed county road commissioner of Los Angeles County, California.

Heber H. Thompson has resigned as county road superintendent of Schuylkill County, Pennsylvania.

F. H. Joyner has resigned as county road commissioner of Los Angeles County, California, and is now consulting engineer for the Willite Paving Co., with headquarters in Los Angeles.

Joe Boggs, Commissioner of Public Roads, Kentucky, has been appointed state highway engineer.

U. Stephens has been appointed resident engineer with the Texas State Highway Department, with headquarters at Ballinger.

G. T. Beattie has been transferred from the Washington office to the Missoula, Mont., office of the U. S. Bureau of Public Roads.

M. E. Kelly has resigned as assistant engineer of Anaconda, Mont., and is now with the Federal Government in the Virgin Islands.

Donald E. Baer has been appointed county road superintendent of Franklin County, Pennsylvania, succeeding George H. Derbyshire.

J. R. Pennell and F. H. Murray, both former state highway engineers of South Carolina, have formed a partnership for the practice of engineering.

Thomas J. Wasser has resigned as president of the New Jersey State Association of County Engineers. Mr. Wasser was recently appointed state highway engineer of New Jersey.

George M. Graham has been elected vice president of the Pierce-Arrow Motor Car Company, succeeding W. J. Foss, resigned. Mr. Graham went to the Pierce-Arrow Motor Car Co., from the Willys-Overland Co. four years ago. During the war Mr. Graham was chairman of the National Motor Truck Committee.

The Province of Saskatchewan, Canada, has recently voted the expenditure of $413,000 out of the $1,700,000 appropriation provided by the Legislature. Agreements are being entered with municipalities for the maintenance of many of the main roads in the province.

Washington County, Maryland, has been unable to dispose of $500,000 road and school bonds and in consequence the county commissioners have decided to curtail public works operations. The bonds were not sold because the bids received were considered too low but they will be offered for sale again when the bond market shows improvement.

Construction in Eastland County, Texas, has been started on a $4,500,000 road contract, which includes the construction of 150 mi. of hard-surfaced road and 50 mi. of graded road. Work was started with 1,000 men and 300 teams, and 8 camps will be provided for the men at various points in the county. It is estimated that it will take two years to complete the contract.

76c— 3

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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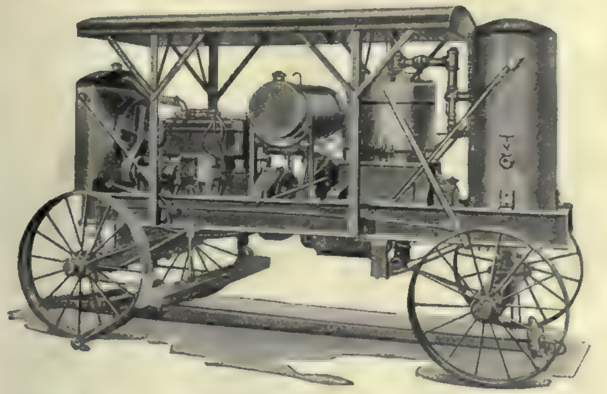

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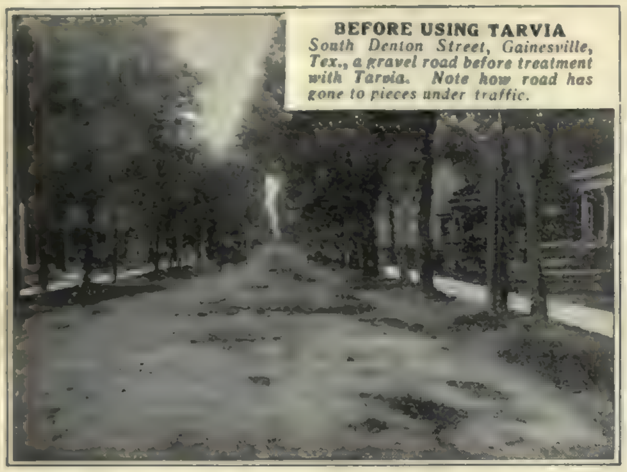
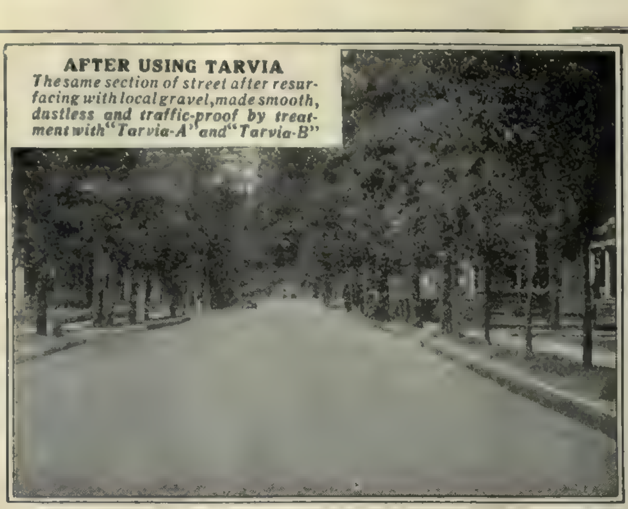


BEFORE USING TARVIA
South Denton Street, Gainesville, Tex., a gravel road before treatment with Tarvia. Note how road has gone to pieces under traffic.



AFTER USING TARVIA
The same section of street after resurfacing with local gravel, made smooth, dustless and traffic-proof by treatment with "Tarvia-A" and "Tarvia-B"

"There are no arguments against saving what you've got"—

THE war taught us many things, not the least of which was thrift—pertinently termed "saving what you've got." Thrift showed us that last year's shoes could be resoled and that the old suit—with little mending and pressing—had another year's wear in it.

It showed many cities and towns that the policy of "saving what you've got" could be applied to their road problems. They reasoned this way:

"High costs may offer good arguments for delaying new road construction at this time, but *there are no arguments against saving what you've got.* To neglect the roads already built is waste, and *waste is a crime.*"

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This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

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Gravel road in Bridgeton, Maine, maintained with "Tarvia-B".

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX

JAMESTOWN, N. Y., AUGUST 18, 1920

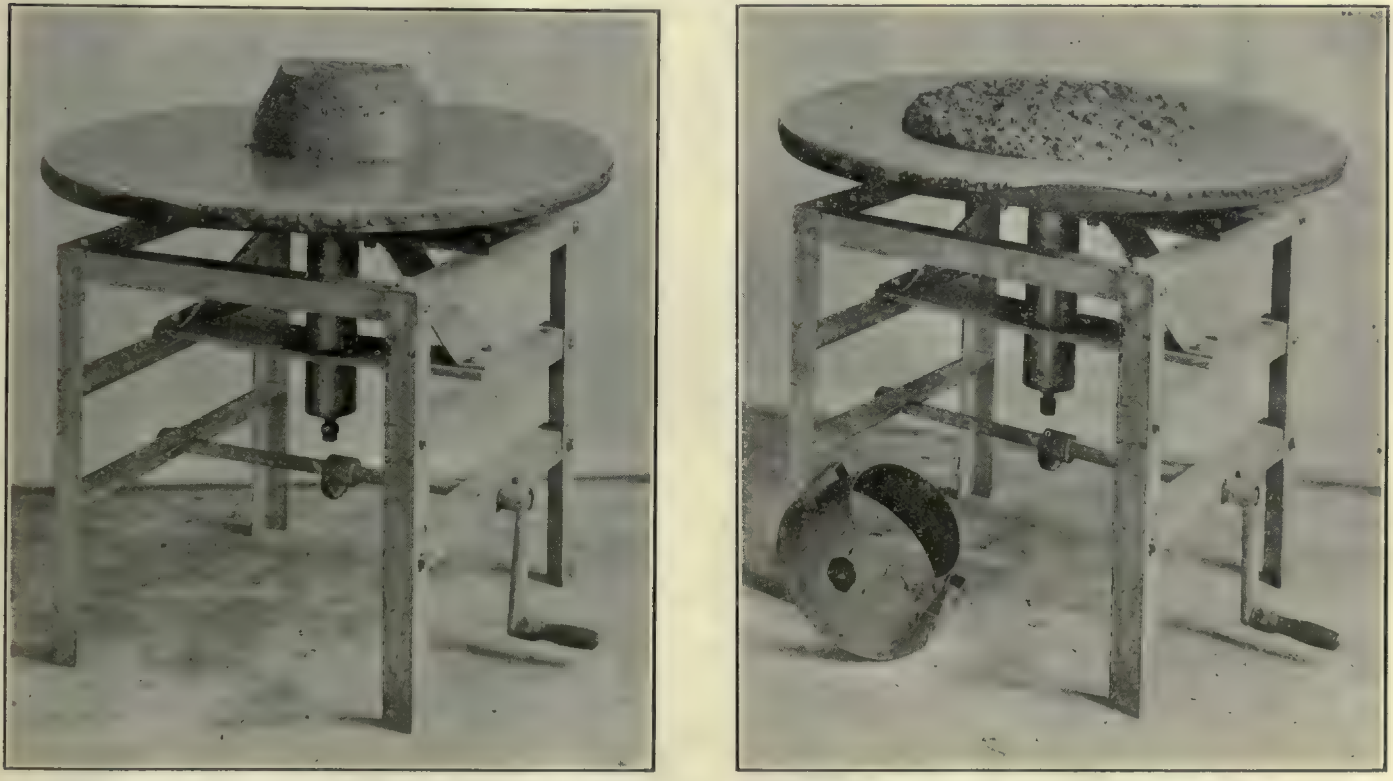
Number
7

Flowability of Concrete and Its Measurement By Means of the "Flow Table"[*]

By G. M. WILLIAMS[†]

The term flowability is one of the several expressions sometimes used to describe the consistency or placeability of concrete. The quality of a concrete or mortar mixture which has to do with ease of placing may be referred to as "consistency," "mobility," "plasticity," "workability," or "flowability," and these words, although having perhaps slightly different meanings to many people, are generally synonymous as used.

The consistency or flowability which must be used in any case is dependent upon the nature of the work, type and arrangement of forms and reinforcing steel. For any given condition there is some minimum flowability which must be attained to result in good workmanship and in economy and proper progress in the process of concreting. With given materials and proportions, flowability may be increased only by the use of more mixing water which will, in turn, lower compressive strength. It is generally agreed that concretes must have the same consistency or flowability to be comparable as to strength, yet we have



Mass of Concrete as Left by Mold, Before Table Top is Dropped

Mass after Spreading—Mold Shown on Floor at Left of Table

FIG. 1—FLOW TABLE USED IN CONCRETE LABORATORY OF THE BUREAU OF STANDARDS

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[*] Published by permission of the Director, Bureau of Standards.

[†] Associate Engineer, U. S. Bureau of Standards.

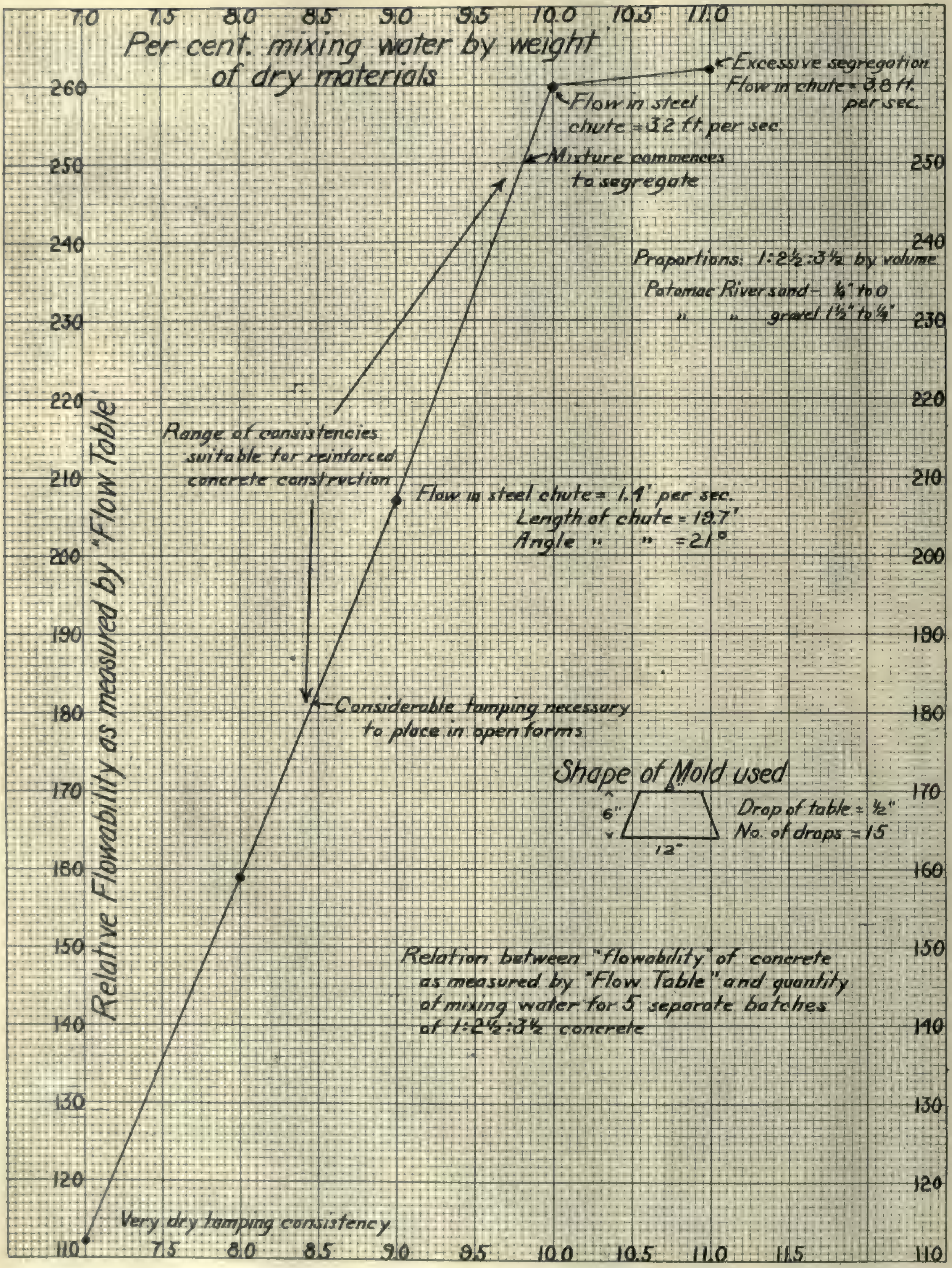
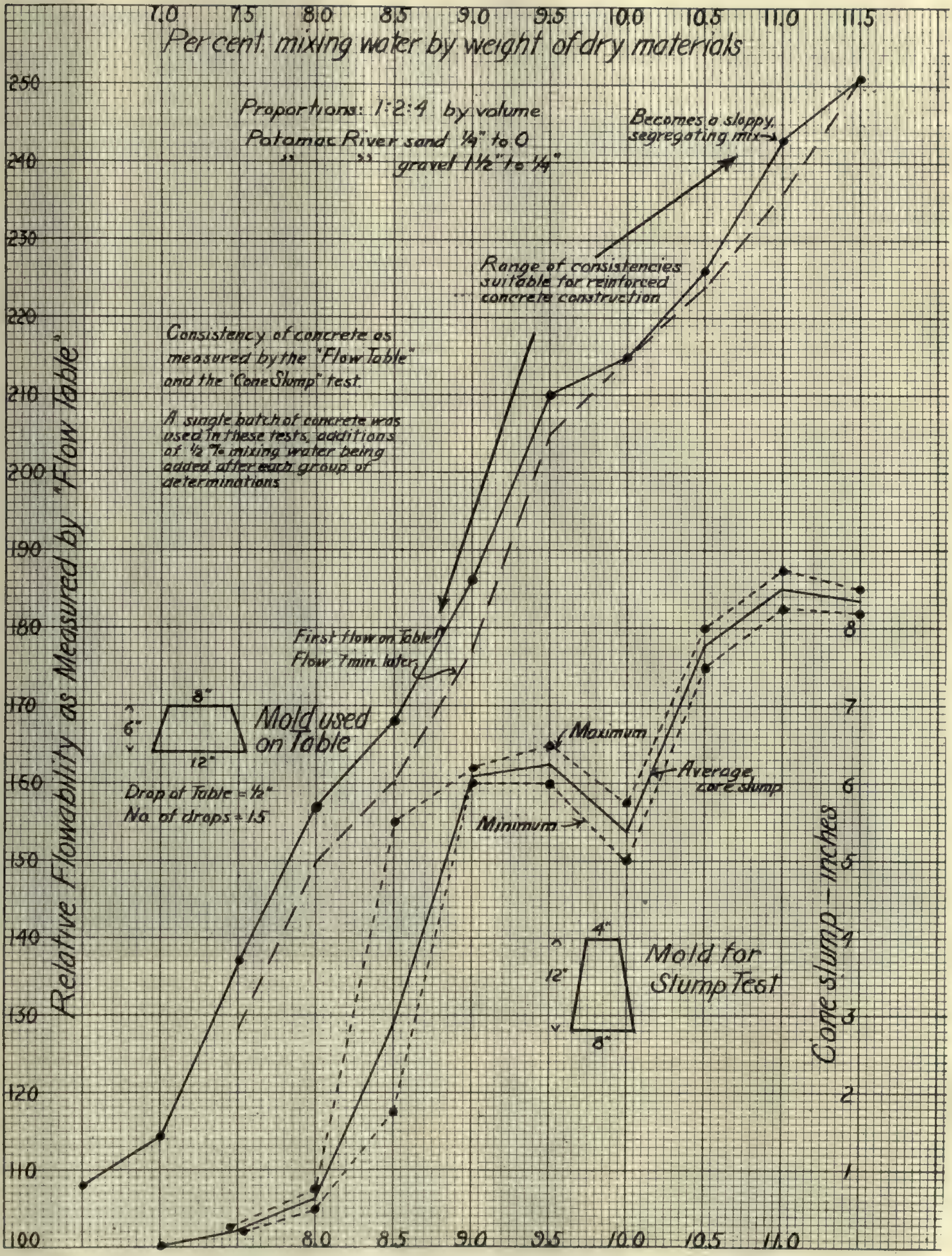


FIG. 2.—CURVE SHOWING RELATION BETWEEN FLOWABILITY OF CONCRETE AS MEASURED BY THE FLOW TABLE AND QUANTITIES OF MIXING WATER



Proportions: 1:2:4 by volume
Potomac River sand ¼" to 0
" " gravel 1½" to ¼"

Range of consistencies suitable for reinforced concrete construction

Consistency of concrete as measured by the "Flow Table" and the "Cone Slump" test.

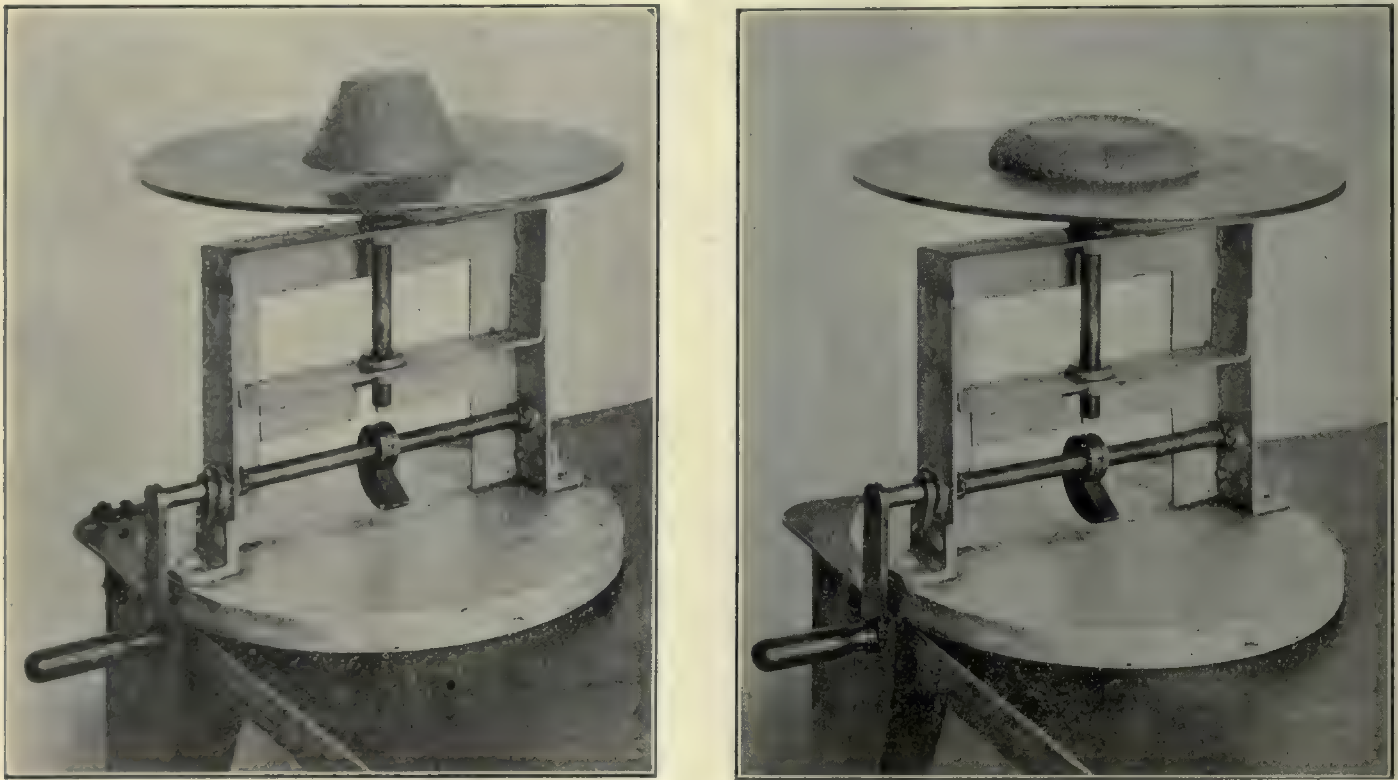
A single batch of concrete was used in these tests, additions of ½% mixing water being added after each group of determinations

Drop of Table = ½"
No. of drops = 15

FIG. 3.—CURVES SHOWING CONSISTENCY OF CONCRETE AS MEASURED BY THE FLOW TABLE AND BY THE CONE SLUMP TEST

had no satisfactory method for measuring and controlling consistency. Consistency has usually been crudely estimated by eye or the judgment or feel of the operator, and as a result, test data obtained even in the same laboratory, must in many cases remain as small and isolated groups of tests, none of which bears any definite and known relation to the others. Studies made of the results of such tests are likely to lead to faulty conclusions, since such concretes are not comparable.

The cylinder slump test and its modification, the cone slump, have been proposed and used for this purpose, and while they are far superior to the old method of "eye" and "feel," they fail to fully meet the requirements of such a test. One critisism of both is that the concrete seldom really slumps when the form is withdrawn, but the mass merely collapses into an unsymmetrical pile. In this respect the cone is less satisfactory than the cylinder, since when the former is employed the mass loses all lateral support as soon as the upward movement of the form is started and the tendency of the top to fall over is unresisted. A further criticism of both slump tests is that with different gradations of aggregates, or with different proportions of cement to aggregate, equal slumps do not result in concretes of equal flowabilities, so that the resulting concretes are not comparable.



Before Settlement of Sample — After Settlement of Sample

FIG. 4.—FLOW TABLE USED IN THE CEMENT TESTING LABORATORY OF THE BUREAU OF STANDARDS FOR DETERMINING NORMAL CONSISTENCIES OF NEAT CEMENT AND SAND MORTARS

Investigations in the concrete laboratory of the Bureau of Standards have emphasized that the control and the measurement of flowability are of fundamental importance, not only in laboratory testing of concrete, but in the practical application of the results of such investigations to concreting practice in the field.

During the past year and a half a new form of consistency measuring apparatus, designated as the "flow table," has been used in the concrete laboratory of the Bureau. The type first employed consisted of a piece of sheet steel about 30 in. square, supported at its center in a horizontal position. A mass of concrete was molded at the center, the mold withdrawn, and the edge of the plate struck a given number of weighted, downward blows with a suitable hammer arrangement. The amount of spread of the mass was a measure of the flowability of the concrete.

The preceding type of apparatus gave very satisfactory results, but further experiment resulted in a table of the type shown in Fig. 1. This consists of a metal covered table top which can be raised vertically by means of a cam working at the end of a vertical post to which the top is attached. The height of drop can be adjusted by means of a bolt at the lower end of the shaft. A mass of concrete or mortar is molded at the center of the table in a sheet metal mold which has the shape of a hollow frustrum of a cone. For aggregates up to 2 in. maximum size this cone has a height of 6 in. and upper and lower diameters of 8 in. and 12 in. For small aggregates, when made up in small quantities, a cone having a

(Continued on page 84)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX AUGUST 18, 1920 No. 7

ENGINEERS AND ENGINEERS—AND THEIR PAY

Some time ago the United States Railroad Labor Board awarded material wage increases to nearly a score of labor unions that were threatening to tie up rail transportation unless their demands were met. Under the new scale, engineers—engine drivers, to be exact—receive $276.21 a month in passenger service, $250.90 in freight service and $213.58 in yard service.

The same Government that, through its Railroad Labor Board, granted these wages pays bridge engineers in the Bureau of Public Roads salaries of from $110 to $225 a month and highway engineers in the same service from $175 to $225 a month. Somewhat extended references to these rates were made in these columns in the issues of June 30 and July 14.

In comparing the remuneration of engine drivers and engineers the foregoing figures are by no means all that must be taken into consideration. The bridge or highway engineer gets his $110 or $225 a month and no more. He frequently has to work late and on Saturday afternoons, Sundays and holidays. When he does, he gets no additional pay. Once in a while he may be thanked. Over-time is all in the day's work. When the engine driver works beyond his "day" or on a Sunday or holiday, he gets additional compensation.

It may be that the railroad worker it not overpaid, considering the cost of living and the hazards of his calling, even though decreased efficiency has followed his successive increases in pay and decreases in working hours. It is quite certain, however, that the highway or highway bridge engineer is underpaid, especially if he is compared with the engine driver in respect to either the knowledge and skill required of him or the training and experience necessary to qualify him for his job.

COAL EXPORTS AND ROAD BUILDING

At the recent hearing of the United States Senate Committee on Reconstruction and Production, James J. Starrow, Fuel Administrator for Massachusetts, testified that because so much coal has been exported, Egyptian railroads are now burning American coal, while the N. Y., N. H. & H. R. R. has been forced to confiscate coal to operate its trains. Subsequently in his testimony, Mr. Starrow read the following advertisement from the June 9 edition of Il Messagero, Rome, Italy—"Colliery Investment Trust, Ltd., London, Paris and New York, is prepared to contract for 10,000,000 tons of American coal for immediate delivery."

This may seem hardly relevant to road building, but it is realy at the root of a good part of the road builder's troubles.

In the light of the facts given by Mr. Starrow, it is not surprising that there should exist in this country a grievous shortage of coal and of open-top cars. A great part of the available railroad equipment has to be used for transporting immense tonnages of coal to the Atlantic Seaboard. But the surprising circumstance in this matter is the priority order of the Interstate Commerce Commission which facilitates the operations of the coal interests in their efforts to reap great profits from foreign markets.

The exportation of coal in unprecedented quantities reduces the supply for home consumption and the cost of coal in this country rises in proportion. Thus is reaped an abnormal profit from both the high prices obtained in foreign markets and the inflated price in the domestic market. Naturally there is imposed great hardship upon our industrial and domestic life.

A further hardship arising from the monopolization of the transportation facilities by coal shipments to seaboard is wrought upon the nation in that the industrial and commercial activities are seriously harassed in every quarter. Manufacturing plants have been forced to cease production in many intances. Construction industries have greatly curtailed operations because of lack of transportation facilities. Road building, especially, has been hampered, even suspended in many states, because of the inability to secure shipments of road materials, notwithstanding the fact that the progress of this country is increasingly dependent upon the development of its highways.

Pennsylvania Sells $12,000,000 Worth of 4½% Road Bonds at Par

State Treasurer Kephart of Pennsylvania announced on July 21 that the state had sold $12,000,000 of its 4½% 3-year bonds to a syndicate of Philadelphia and Pittsburgh bankers at par. The state originally planned to sell $18,000,000 of the $50,000,000 road bond loan, but this plan was changed about two months ago, it being decided to make an offering of short-term bonds.

Eastern Section of Lincoln Highway Being Marked

The official road marking crew of the Lincoln Highway Association has started the systematic marking of the Lincoln Highway in the eastern section. It is expected that the crew, which is now at work in Pennsylvania, will reach its western destination, Omaha, Neb., by Oct. 1.

Through the courtesy of the Automobile Club of Southern California and the California State Automobile Association, the western section of this highway from Omaha to San Francisco, Cal., has been marked with enameled steel markers. This idea is now being carried out for the remaining distance across the continent. The markers are 10x21 in., set upon chestnut posts.

The equipment of the marking crew is complete in every detail, including not only the 3,000 markers and posts which have been shipped to points along the route, but also 25 gal. of red, white and blue paint and an adequate supply of drills, hammers, brushes, sledges, crowbars, shovels, etc.

Lawsuit Halts Bridge Construction

The construction of the Pocomoke Bridge at Pocomoke City, Md., under contract with the McLean Contracting Co., has been stopped by a bill of complaint asking for an injunction, filed by Fisher & Carozza Brothers Co., which firm claims the right to the contract for the work. The proceedings are directed against John N. Mackall, Omar D. Crothers and D. C. Winebrenner, composing the Maryland State Roads Commission.

The bill of complaint states that in November, 1919, the State Roads Commission awarded a contract for the construction of the bridge to plaintiff for $67,153. It is alleged that alterations were made in the plans and additional payment was agreed upon, but the commission desired to insert unreasonable terms in the supplemental contract.

While negotiations were pending between plaintiff and the commission, the contract was awarded to the McLean Contracting Co. for $85,000 without advertising for competitive bids, and without requiring unit prices to be stated in the bid, it is alleged.

An injunction is asked restraining the McLean Contracting Co. from proceeding with its work and restraining the commission from paying any money to that company.

Danger Signals to Be Placed in Maryland

Railroad Grade Crossings and Dangerous Curves to Be Protected by 2,000 Signs

An arrangement has been made by the Maryland State Roads Commission with a manufacturer for the erection of 2,000 warning signals on the roads of that state.

The signals will be placed at railroad crossings and dangerous curves and are so constructed that an intermittent and distinctive light is provided during the night and a prominent warning sign during the day. These signals are to be provided without expense on the part of the state, the manufacturer being recompensed by renting advertising space on them. Similar signaling devices, it is reported, are being installed on roads in Virginia.

Road Work in Lincoln County, Washington

Rapid Progress Being Made with 5 Crushers, 16 Trucks and Large Labor Force in 10 Camps

Road work in Lincoln County, Washington, is progressing rapidly, with 10 grading camps, 5 rock crushers and 16 trucks.

The grading of the 7-mi. stretch north of Davenport and of 12 mi. between Readan and Edwall has been completed and the surfacing is well under way. The grading and surfacing of 11 mi. of the highway running south from Harrington have been completed. Work is also being done on highways Nos. 6 and 3A. Seven miles of Sunset Highway are being surfaced with gravel shipped from Hartline. Approximately 170 men have been engaged in work on these roads since the middle of March.

Road Work in Wayne County, New York

Considerable work is being done on the highways of Wayne County, New York, according to County Superintendent of Highways, William G. Sisson.

The town of Lyons has built 1.5 mi. of stone road on the Pilgrimsport Road and many of the roads in the town will be resurfaced and graveled.

The town of Ontario will improve the road to the Monroe County line and will spend $5,000 on the Lake Road, building the roadway 12 ft. wide, with stone base and cinder top.

Two miles of road have been built in the town of Galen on the Jenkins road. Concrete bridges in this town will cost over $7,000.

The town of Sodus will spend $21,800 in general repairs to the highways. A stone base road will be built from Lime Kiln to South Sodus, the Lake Road will be improved and the road from Wallington to Proseus Corners will be repaired and oiled. The road from Proseus Corners to Sodus Point has already been repaired.

A steel bridge is being built in the Town of Macedon across Ganargua Creek by the Groton Bridge Co., at a cost of $12,000.

Rutherford County, Tennessee, Markets $200,000 Work of 6% Bonds

The $200,000 of highway bonds recently issued by Rutherford County, Tennessee, have been sold to McNairy & Co., of Chicago, Ill., at par, with a small bonus. These bonds bear 6% interest. Funds from federal and state sources, together with the money derived from the sale of these bonds, make $600,000 immediately available for work in that county. This money will be used in building the Dixie Highway from the Davidson County line through Murfreesboro to the Bedford County line, and also for work on the Woodbury Road and the Memphis-Bristol Highway.

To Build Ford Instead of Bridge

Winneshiek County, Iowa, to Erect Structure that Will Serve as a Bridge Under Ordinary Conditions and as a Ford During High Water

Winneshiek County, Iowa, will build a concrete ford over a turbulent creek instead of a bridge. County Engineer Arenson is preparing plans for the ford with a waterway beneath sufficiently large to allow for the ordinary flow of the creek. During flood periods the water will pass over the top of the ford.

This creek rises and falls very rapidly and it is seldom more than a few hours after reaching high level before the water recedes to normal. The drainage area of the creek compresses about 5,000 acres of very hilly land and the run-off following rain storms is so rapid that if a bridge were constructed a very large waterway would have to be provided.

Highway Work in Missouri

The Missouri State Highway Department on July 14, approved the project for the construction of a bridge across the White River at Forsythe, Taney County, to cost $72,000. Applications for state and federal aid on 29.13 mi. of road were also approved, the estimated cost of the highways to be $195,982. This brings up the total mileage approved under the new law to 1,793 mi., the construction of which, it is estimated, will cost $18,543,865. Of this amount, the Federal Government will pay $8,681,957 and the state, $1,416,760. The new projects approved are:

Daviess County, 7.64 mi. of 24-ft. road between Jamesport and the Grundy County line; estimated cost, $41,634.

Washington County, 8.24 mi. of 20-ft. road between Potosi and Berryman; estimated cost $43,093.

Greene County, 4.25 mi. of 16-ft gravel road between Sequito Park and the Christian County line; estimated cost, $21,250.

Stoddard County, 9 mi. of 16-ft. gravel road between Dudley and Dexter; estimated cost, $90,000.

University of Michigan Announces Graduate Courses in Highway Engineering and Transport

The University of Michigan, Ann Arbor, Mich., has announced the winter schedule of graduate short period courses in highway engineering and highway transport for the 1920-1921 term. These courses are arranged especially for men engaged in the practice of highway engineering and highway transport and will be given as follows:

December 8 to 21, 1920

C. E. 76. Highway Engineering Theory, Design and Economics. Professor Blanchard.
C. E. 78. Grading Machinery and Operations. Professor Bateman.

December 27, 1920, to January 7, 1921

C. E. 67. Highway Transport Surveys. Professor Blanchard.
C. E. 71. Highway Specifications, Contracts and Jurisprudence. Professor Riggs.

January 10 to 21, 1921

C. E. 72. Earth, Sand-Clay, Gravel and Broken Stone Roads. Professor Bateman.
C. E. 81. American and English Highway Transport Methods. Professor Blanchard.

January 24 to February 4, 1921

C. E. 68. Bituminous Surfaces and Bituminous Pavements. Professor Blanchard.
C. E. 74. Bituminous Materials. Professor Bateman.
C. E. 80. Interrelationship of Highway, Railway and Waterway Transport. Professor Riggs.

February 7 to 18, 1921

M. E. 40. Mechanism, Operation and Maintenance of Motor Trucks, Tractors and Trailers. Professor Lay.
C. E. 69. Highway Laboratory Research. Professor Bateman.
C. E. 70. Highway Structures. Professor Gram.
C. E. 79. American and English Highway Traffic Legislation and Regulations. Professor Blanchard.

February 21 to 25, 1921

Seventh Annual Michigan Conference on Highway Engineering.

February 28 to March 11, 1921

C. E. 73. Brick, Cement Concrete, Stone Block and Wood Block Pavements. Professor Bateman.
C. E. 75. Highway Engineering Seminar. Professor Blanchard.
C. E. 82. Highway Transport Management, Costs and Record Systems. Professor Blanchard.

March 14 to 25, 1921

C. E. 77. Highway Engineering Financing, Administration, and Organizations. Professor Blanchard.
C. E. 83. Highway Transport Seminar. Professor Blanchard.

Flowability of Concrete and Its Measurement by Means of the "Flow Table"

(Continued from page 80)

height of 3 in. and upper and lower diameters of 4 in. and 6 in. is used. The mass of concrete is tamped just sufficiently to completely fill the form, the form is withdrawn, and the table top is dropped 15 times through a distance of ½ in. The mass flattens and usually spreads concentrically. Two diameters at right angles to each other are measured—the long and the short if difference is apparent—by means of a self-reading caliper which is so graduated that the sum of the two readings is the value for "flowability," which may also be calculated by dividing the new diameter by the old and multiplying by 100.

A typical curve showing the relation between the flowability of concrete as measured by the "flow-table," and the quantity of mixing water used is shown in Fig. 2. Five separate batches of 1:2½:3½ volume proportion concrete were prepared with percentages of mixing water ranging from 7 to 11. Seven per cent. resulted in a concrete too dry for ordinary construction work; 9% of mixing water resulted in a concrete which flowed sluggishly in a steel chute which had an angle of 21 deg.; 10% furnished as wet and fluid a concrete as is ever needed in practice. With 11% a sloppy, segregating concrete, difficult to properly sample, was obtained. The added water in excess of 10% resulted in practically no increase in flowability as measured by both the flow table and the steel chute. This straight line relation between mixing water and flow as measured by the flow table is characteristic of results obtained with other concretes, mortars, neat cement and lime pastes.

Fig. 3 shows graphically some results of tests in which the flow table and the cone slump were used. A single batch of concrete was employed in this case for all determinations shown, additional quantities of mixing water being added for each ½% increase. Due to loss of paste, absorption, etc., a slightly flatter curve was obtained with the flow table than resulted for the individual batches of concrete included in Fig. 2. With the exception of the dip of the curve for 10% mixing water, the values for the cone slump are of the usual order of accuracy obtained by either of the slump methods. It is seen that the change in values for the "cone" between 8½% and 9%, omitting the 5½ slump for 8½%, is greater than that caused by the addition of all the mixing water beyond 9%. A really desirable and necessary consistency for reinforced concrete work was not obtained until 9% mixing water was used. It is characteristic of consistency measurements made by the slump methods that marked differences in slump result for differences in quantity of mixing water over a very narrow range only, and before practical working consistencies are obtained.

The advantages of the flow table over the slump methods may be listed as follows:

1. The flow table accurately measures flowability or consistency of a concrete, mortar, cement or lime pastes for all consistencies varying from dry masses which have only a slight tendency to flow or change their shape when acted upon by external forces, to those consistencies which are so fluid that the water and laitance will flow away from the coarse aggregate.

2. The relation between flowability and quantity of mixing water is practically a straight line relation for all workable and usable mixtures and consistencies.

3. The stiffening of a mass of concrete due to absorption of water by the aggregate, evaporation or setting of the cement is indicated by reduction of flow of the mass on the flow table.

The rapid stiffening due to absorption of water by the cement and the aggregate is so marked that it is found necessary to measure the flowability at some definite interval of time after the addition of the mixing water. This is especially necessary when working with concretes composed of aggregates varying widely in gradation. This time interval is that which would be required in practice to properly place the concrete in the forms.

While the apparatus shown in Fig. 1 is rather heavy and cumbersome for use in the field, the method of test is fully applicable to field conditions, and a machine of more recent design now used in the laboratory can easily be carried about by one man. So far as comparative tests have been made on various tables, the results indicate that flow for any given number of bumps and height of drop is independent of the weight of the top, so that in standardizing the apparatus consideration need be given only to (a) size and shape of molded specimen, (b) height of drop of the table top, and (c) number of drops of the table top.

Although the flow table was first employed as a means of measuring consistency of concrete, its use has indicated that it may be of value in the control and measurement of several other properties involved in the tests of cement and concrete.

1. Segregation.—In working with dry concretes or concretes having a small ratio of cement to aggregate, or small quantity of fine aggregate, it has been noted that considerable of the coarse aggregate may be found outside of the well defined line of mortar which is considered as the flow line. The quantity of such coarse material appears to be a measure of the harshnesss or tendency to segregate, and such observations will permit of determination in the laboratory of the ease of working in the field of different combinations of aggregates whose flowabilities are the same.

2. Time of Set.—The rate of hardening of mortar or concrete from the time mixing water is added

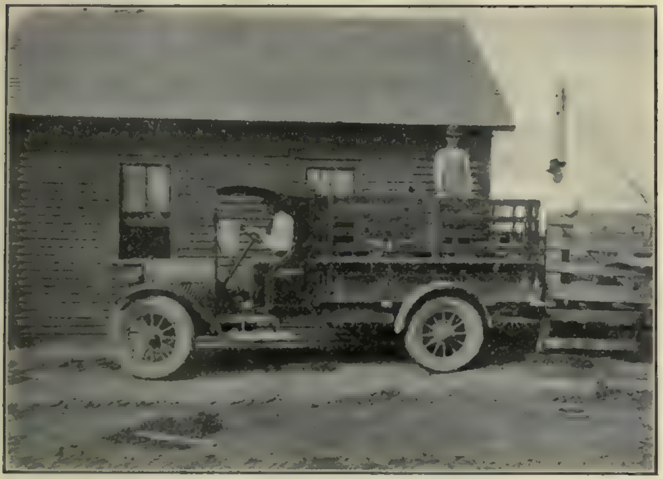
(Concluded on page 89)

HIGHWAY TRANSPORTATION

Motor Trucks Haul Farm Products to Market

Importance of the Motor Truck in the Distribution of Foodstuffs—Use of Trucks by Farmers Increasing—Results Secured by Utilization of Motor Trucks

The motor truck is fast becoming a necessary part of the equipment of the progressive farmer because it means greater efficiency in the production and distribution of food products. Confronted with a diminishing food supply, this nation is entering upon an era in which will be developed a more intensive cultivation of land and the elimination of much of the circuitous course of foodstuffs from producer to consumer. Better roads will be one of the chief factors in bringing about these results. commenting upon this progressive tendency, B. M. Pettit, of Akron, O., recently spoke bofore a group of manufacturers and agriculturists in New York City, giving in his talk some pertinent and significant statistics.



OLDSMOBILE TRUCK CARRYING HOGS TO MARKET IN IOWA

"Intensive farming production," said Mr. Pettit, "accelerated by the use of the motor truck is the remedy for critical conditions facing the country because of a shortage of farm labor. America is just beginning to awaken to the fact that the social and industrial army travels on its belly quite as much as the military. The motor truck is the keystone for future development of motor power for farmers. Unless transportation can be profitably motorized there is little use of motorizing production.

"When we stop to think that in 1880 about 70% of the population was producing food, while the number today has fallen below 30%, it is easy to see that we are confronted with a critical situation unless a remedy can be found."

An investigation conducted by Mr. Pettit discloses the fact that 44% of the farmers not using trucks are interested in them. It was also shown that interest in trucks is uniform in all sizes and from all agricultural sections, interest not depending upon the size of farm or type of agriculture.

"The farmer with small acreage has in many cases a more acute transportation problem than one with larger acreage," he continued. "It is interesting also to find that the interest in trucks is not confined to any particular section of the country.

"The most significant figures are those which give actual results which have been accomplished by truck operators. About 77% of the users of trucks report an ability to market their products at points other than those they had been able to use previously. This same percentage reports a marked improvement in the condition of their load and a reduction in shrinkage. About 69% of them report a better price for their products. The investigation shows an actual economy in the hands of those who are using trucks.

WHITE TRUCKS LOADED WITH CORN FOR A CANNERY IN MARYLAND

"This is further borne out by the fact that 75% of the truck users report that they have been able to get along with less help and 74% with fewer horses. When a manufacturer, sales manager or banker stops to consider the seriousness of the farm labor situation, he needs no more powerful comment than these figures to illustrate the urgency of the use of motor truck production and distribution among the farmers of the country.

"The question of the attitude of farmers toward the tire equipment brings out some significant facts in that a very large percentage of those using trucks on both solid and pneumatic tires, prefer the latter because of their traction ability and the fact that they cushion the load and increase the speed.

"A thing which few people realize is that the truck enables the farmers to live further from the town, thus buying cheaper land and making more profit. This is borne out by the figures that the average haul by the farmer with a truck is 13.4 mi. against 5.6 mi. for horse users. The truck is actually saving the farmer time, which is more than money to him. By truck the farmer saves practically two-thirds of the time on the road.

"The motor truck, the tractor and the automobile are as essential to the farmer as are the plow, the binder and the threshing machine."

The United States Department of Agriculture during the past winter carried on an investigation among farmers in eleven eastern states relative to the value of the motor truck in the marketing of their produce. The farmers owning motor trucks were requested to report to the department the type and sizes of their farms, the use made of their trucks, operating costs, advantages and disadvantages of the truck for use by the farmer, and other related information.

A study of the reports of 753 of these farmers has just been completed by the Office of Farm Management and Farm Economics. The farms which these men operate are of all sizes and types, and the motor trucks used range from 1 ton to 5 tons capacity. The rated capacity of very few trucks, however, is greater than 2 tons, and nearly half of them are of the 1-ton size. Only 18% of these farms are less than 5 mi. from market and about 25% are 20 mi. or more from market.

From these reports it is found that the time required for hauling materials to and from these farms is one-half to two-thirds less than the time required to do the same hauling with horses. It was also shown that the trucks used on these farms were used almost exclusively in hauling the products of the land over the highways to market; the work on the farm being done with horses and wagons.

The average cost of operation of the ½-ton truck was about 8 ct. per mi.; of the ¾-ton truck, about 13 ct.; of the 1-ton truck, about 12 ct.; of the 1¼-ton and the 1½-ton trucks, about 19 ct., and of the 2-ton truck, about 18 ct.

About four-fifths of the farmers state that their trucks decrease the expense for hired help, the average estimate of this saving being $324 per year.

Good Roads Fleet Tours Ontario

A fleet of 60 passenger automobiles and motor trucks carrying 200 good roads boosters recently started from Detroit, Mich., and made a 1,400-mi. trip through Canada. The tour was held under the auspices of the Michigan Pikes Association, with W. D. Edenborn, Automobile Editor of the "Detroit News," as tour manager, for the purpose of stimulating interest in the construction of a highway that would enable motorists to travel through Ontario via Windsor, Toronto, North Bay and the Soo. The construction of such a highway would enable tourists to motor through the summer resort country, entering Canada either at the Soo or Windsor and travel in a circle described by going to North Bay and Toronto.

With a total of 60 cars, including three kitchen trucks, a motorized lighting plant and a shower bath truck, the fleet traveled for 15 days, meeting with even more enthusiastic receptions than on five previous trips. Over 90 road meetings were held on the trip, among the speakers being, F. G. Biggs, Minister of Public Works, Ontario; Albert Grigg, Deputy Minister of Lands and Forests, Ontario; L. E. Allen, President of the Ontario Good Roads Association; Horatio S. Earle, of Michigan; Frank F. Rogers, State Highway Commissioner, Michigan, and Capt. W. S. Gilbreath, promoter of the Dixie Highway.

Among the features of the tour that attracted considerable attention were the Ford band of 37 pieces and the Goodyear truck that holds the coast-to-coast record of 14 days and has traveled 120,000 mi. since 1917.

Railroad Congestion and the Remedy

Car Shortage and Terminal Congestion are Crippling Industry—Relief Obtainable by Using the Truck for Short-Haul Traffic, According to Motor Truck Company Official

"The industrial United States of today," writes R. C. Burritt in the Chicago "News," "is a cripple. In the broad sense business is either limping along or beginning to stagnate. The shop, the factory, the home, the comfort and welfare of practically every man, woman and child are threatened.

"Railroad congestion is the menace.

"It has brought about a shortage of cars at loading points, necessary to distribute the nation's wealth. The shortage has slowed down the production of coal, which in turn, is slowing down the production of essential commodities and may bring industry to a dead halt next winter in many places.

"Drastic measures alone can save the nation from a severe depression, with hundreds of thousands of wage earners unemployed, with bread lines in many of the great cities, with cold homes, lightless nights and all the accompanying misery."

Commenting upon this statement, R. C. Spinning, Advertising Manager of the Service Motor Truck Co., Wabash, Ind., writes:

"There are obviously two ways in which car shortage can be met. One is by building enough cars to handle the traffic. This, however, would be a three-year job with our car shops working at full capacity. Increased car production can not be made in time to help the present crisis. And even though 500,000 new cars could be put on the tracks today, with locomotives to haul them, it is doubtful that the present terminal congestion would be relieved. In fact, the situation would probably grow worse, for inadequate terminal facilities would prove to be the limiting factor.

"The second way to meet the car shortage is to get more work from the cars we have. Experts say that our freight cars average only 24 mi. a day, but if we could increase this travel to 30 mi., it would give us the equivalent of 600,000 additional cars—enough to take care of our present needs.

"Terminal congestion can be remedied if we will relieve the railroad of the short haul by giving it to the motor truck. Freight cars in short haul seldom carry their full capacity. One investigation made on the Cleveland, Cincinnati, Chicago & Saint Louis R. R. showed that the average car load for less than carload freight, which is the short-haul traffic, was about 5 tons. The capacity of these cars averaged 35 tons.

"The motor truck can handle short-haul freight and make money doing it. It can deliver short-haul freight at the consignee's door in quicker time and in better condition than can the railroad. The use of the motor truck for short hauls will relieve our railroad terminals, permitting the railroads to take care properly of long hauls."

National Automobile Chamber of Commerce Urges Provision for Snow Removal

Realizing that the motor truck will play an important part in relieving the freight congestion during the coming winter, the National Automobile Chamber of Commerce has sent the following communication to its members:

"A careful review of the transportation situation makes it evident that during the coming winter the railroads will be confronted with congestion problems as great as, if not greater than, those which held up their freight movements last winter.

"As before, so again this will throw upon motor vehicles the necessity of hauling vast quantities of commodities over the highways and in addition will oblige manufacturers of motor vehicles to deliver their products to purchasers by the overland drive-away method.

"Both of these considerations make it imperative that those highways over which the bulk of these commodities and the majority of these drive-aways will pass, be kept free from ice and snow at all times.

"As a general thing such traffic passes over the highways under state control, although there are long strips of thoroughfares where counties, cities and towns exercise jurisdiction.

"The highway officials of some of these states and other districts now have the power and appropriations necessary to care for snow removal during the winter 1920-1921; the majority of them have not. It is, therefore, imperative that members learn how the matter stands in the case of highways in which they are interested and wherever no provision has been made for this important work, take active steps to point out to the authorities the need for looking after this vital matter at once."

Influence of Grade on Highway Traffic Will be Studied

Committee on Economic Theory of Highway Improvement to Conduct Series of Tests With Motor Trucks Having Various Loads

The committee of the National Research Council on the Economic Theory of Highway Improvement, of which T. R. Agg, Professor of Highway Engineering, Iowa State College, Ames, Ia., is chairman, will conduct a series of tests on the influence of grade on highway traffic on the old National Highway near Columbus, Ohio, where headquarters will be maintained.

The Motor Truck Committee of the National Automobile Chamber of Commerce has endorsed this work of the National Research Council committee and has promised to place ten trucks with drivers and mechanics at the disposal of Professor Agg. Tests will be started on Sept. 1 and continue about three weeks. A recording flow-meter has been developed for use in the tests and preliminary studies with trucks indicate that the proposed series of tests will give exceedingly valuable information.

The following communication from Professor Agg to the National Automobile Chamber of Commerce sets forth the purposes of these tests:

"During the past few years it has become increasingly apparent to highway engineers that better information is needed in regard to the effect of grade upon the economical operation of motor vehicles. This is particularly true in the case of those highways which have become important routes for motor trucks. Various agencies have been engaged in studies of this general subject, but no investigations of any considerable magnitude have been undertaken. Recently, there was organized by the Engineering Division of the National Research Council, a special committee to take up this particular subject, of which the writer is chairman.

"The first problem to be undertaken is that of determining the effect of grade upon motor truck operation, and it is proposed to carry out a series of tests for the purpose of obtaining information on this subject. It is desired to secure the cooperation of the National Automobile Chamber of Commerce throughout these investigations. The specific assistance desired by the committee is in the way of supplying motor vehicles for use in the tests. Plans have been perfected whereby the services of a few men have been secured to actually carry out the field investigations, but at the present time there is no neans by which the committee can secure the motor vehicles needed. The National Automobile Chamber of Commerce, through its Motor Truck Committee, is invited to make available for the use of the committee during the coming summer, 10 trucks.

"Each pair of trucks should be identical in type, except that in one case pneumatic tires and in the other solid tires are used. In the case of the ¾-ton and the 5-ton, the tire equipment would be identical, but it is desirable to always use two vehicles in order to check results.

"Each of these vehicles would actually be employed in the test for about three weeks, during which time the trucks would be operated by skilled drivers furnished by the manufacturer of the truck and maintained by a mechanic also furnished by the manufacturer. It is probable that the committee would not require more than 4 trucks at any one time, and it might possibly prove necessary to complete the work with each pair of trucks before the trucks of another weight were started. The operation of the test will be under the supervision of some one provided by the Research Council and the expense in connection with operation, such as cost of fuel and oil, transfer of loads from time to time, and other incidental expenses of that sort, will also be cared for by the Research Council Committee. It is hoped, however, that the Motor Truck Committee of the National Automobile Chamber of Commerce can arrange to furnish the trucks, drivers, and mechanics without expense to the Research Council."

EQUIPMENT—TRADE—MATERIALS

New Jersey Will Lay Experimental Road

The New Jersey State Highway Commission has decided to construct a road between Rahway and Elizabeth, a part of one of the principal highways between New York City and New Jersey seashore resorts, partly of concrete and partly of Warrenite pavement. The latter section will extend 4.5 mi. and the former 1 mi. The road will be 29 ft. wide and the data secured are to be used in the controversy which has existed in the state relative to materials of road construction. It is expected that the work will be completed before winter.

The Use of Labor Saving Equipment in Paving Chicago's Alleys

Labor saving machinery is being introduced more and more in all branches of industry. During the past five years the shortage of labor has grown to critical proportions and contractors have turned to mechanical devices to prevent operating costs becoming prohibitive. As a result of this movement it is not surprising to find contractors operating with one-quarter to one-half less men than formerly employed on similar jobs.

In paving alleys in Chicago, Ill., the Schmidt Construction Co. is using machinery for the handling and transportation of materials in a way that merits attention. The work is scattered over different parts of the city, making it necessary to move the equipment every few days.

The average width of pavement laid on the alleys is 15 ft. 4 in. The specifications call for concrete, 1:2:3, laid 7 in. thick. About 1,100 sq. yd. make up the area of each alley job.

The present equipment of this contractor consists of one Jeffrey automatic loader, one Barber-Greene automatic loader, one Koehring mixer and three gasoline Clark tructractors. With the use of this equipment for the speedy transportation of materials, about 750 sq. yd. of pavement are laid daily, whereas formerly, with hand labor, the daily average was 600 sq. yd., or less, depending upon weather conditions.

The Jeffrey loader is situated at the sand storage pile and the Barber-Greene loader at the stone

JEFFREY LOADER DISCHARGING SAND INTO CLARK TRUCTRACTOR

CLARK TUCTRACTOR DUMPING BATCH INTO SKIP OF KOEHRING MIXER storage pile. Cement is dumped upon the aggregate from the bags. The tructractors receive the aggregate from the loaders, taking on each trip 6 cu. ft of sand, 9 cu. ft. of stone and 3 cu. ft. of cement. The dry batch is dumped directly into the skip of the Koehring mixer.

The average round trip haul from storage piles to mixer is about 1,000 ft., and is made by the tructractors in 3 minutes. The mixer operates at a speed of about one mix per minute.

Twenty men are employed on the job, 3 on the three tructractors, 6 on the two loaders, 9 on the mixer and 2 loading cement. In the operation of the mixer 4 laborers work on the wet side, 2 laborers on the dry side, and 2 mechanics and 1 fireman operate the mixer.

Microstructural Changes Accompanying Tempering of Hardened Steels

Work has been started by the U. S. Bureau of Standards on an elaborate series of examinations to determine the changes which occur in the structure of hardened steels upon tempering. Very little information is available on this subject, and in particular, good micrographs, demonstrating the changes which occur, are rare. It can be shown by such other methods as magnetic tests and density determinations that pronounced changes occur in the hardened steel upon tempering, but the changes in the microstructure are much less plainly marked. For this reason there is need for more careful study of this phase of the metallography of steel. The specimens to be studied will include six different types, varying in carbon content from .07% to considerably above 1.00%. The steel will be hardened by quenching in water from various temperatures and the length of time at which the material is held at the quenching heat will also be taken into consideration.

Tests of Aged Cement in Concrete

Owing to a shortage of cement in the District of Columbia for use on construction work being carried out by the Engineer Corps of the Army, the U. S. Bureau of Standards was recently asked to determine the strength of concrete made from cement which had been in storage about a year and a half. The cement as received was put through a sieving process to remove the lumps. The cement after sieving, as well as the crushed lumps, was made into separate concretes which were compared with concrete made from cement recently purchased in the local market.

From these tests it was found that a 1:1¼:2½ mix of the old cement would give approximately the same strength as a 1:2:4 mix of fresh cement. It was recommended that the lumps be sieved out of the old cement before using. Similar tests were conducted on aged cements submitted by the U. S. Engineer Office at Vicksburg, Miss., the results indicating that a 1:2¼:4½ mix of the aged cements gave approximately the same strength as a 1:3:6 mix of fresh cement.

Flowability of Concrete and Its Measurement by Means of the "Flow Table"

(Concluded from page 84)

is measured by "flow" of separate specimens on the table at intervals. A practical application was the determination of the rate of hardening of two mortar floor toppings, one containing an accelerator, on actual construction work. The mortar containing the accelerator was finished in one half of the time required for the other, and the rate of hardening as measured on the flow table was twice as fast for the former.

3. Normal Consistency.—The apparatus shown in Fig. 4 has been in use in the cement testing laboratory of the Bureau for checking determinations of the quantity of mixing water required for normal consistency of neat cement and standard sand mortars. Results so far obtained indicate the method to be more accurate and consistent than determinations by the "ball method" or the Vicat needle.

4. Selection of Concretes for Field Use.—The flow table furnishes a means of measuring and expressing the missing factor, "flowability," which is needed to permit of predicting in advance the approximate strength values which may be obtained for any given proportions of cement and aggregate. The ranges of strength values which may be expected for any aggregate when used with varying cement content and for the extreme ranges of consistencies needed in practice can be determined by a series of tests. Knowing in advance the type of construction, experience will permit the minimum usable flowabilities to be estimated, and for any required strength values the necessary ratios of cement to aggregate may be selected. The selections may be checked by the results of field tests of concrete, and a few trials will indicate strength variations which may result for the degree of thoroughness of field inspection employed, and permit of proper allowance for unavoidable variations in cements, aggregates, and curing conditions, etc.

The foregoing description of the flow table and its method of use is given with the hope that those who are interested in the testing of concrete will give the method a trial. No doubt further tests under widely different conditions will point out modifications and changes in the method and apparatus which will increase its value, and any criticisms based upon its application under such conditions will be appreciated.

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Talbot County, Maryland, has sold a $200,000 road bond issue to a syndicate of bankers. The bonds bear 5½% and are tax exempt and it is reported that there were several bidders for the issue.

MEETINGS

Calendar of Coming Meetings

August 24-26.—League of Cities of the Third Class in Pennsylvania.—Annual Convention, York, Pa. Secretary, Fred H. Gates, City Clerk, Wilkes-Barre, Pa.

Aug. 25-27.—Union of Nova Scotia Municipalities.—Annual Convention, Windsor, N. S., Canada. Secretary, Arthur Roberts, Town Solicitor, Bridgewater, N. S.

Sept. 1-3.—Michigan State Good Roads Association.—Annual Meeting, Lansing, Mich. President, P. T. Colgrove, Hastings, Mich.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Sixth National Exposition of Chemical Industries

The sixth National Exposition of Chemical Industries will be held, Sept. 20 to 25, in Grand Central Palace, New York City. Since chemistry enters practically every phase of industry, this exposition will be of general interest and will show what American chemists are doing in promoting the industrial and commercial expansion of the United States.

Highway and Highway Transport Education Committee of the National Automobile Chamber of Commerce

The Highway and Highway Transport Education Committee of the National Automobile Chamber of Commerce held a meeting on July 31 in the office of F. L. Bishop, of the University of Pittsburgh. This committee was organized to formulate a policy relative to instruction in highway engineering and highway transport engineering in the schools and colleges of the country.

The committee approved a plan for the holding of conferences on this subject at at least ten of the leading universities. Sub-committees were also appointed and will report at the meeting to be held in Washington on Sept. 18.

The meeting was attended by United States Commissioner of Education P. P. Claxton, Chairman; Dr. W. C. John, of the U. S. Bureau of Education; T. H. MacDonald, Chief of the Bureau of Public Roads; Roy D. Chapin and Pyke Johnson, representing the National Automobile Chamber of Commerce; Paul D. Sargent, President of the American Association of State Highway Officials; F. L. Bishop, Dean of Engineering, University of Pittsburgh; Prof. C. J. Tilden, Yale University; Ernest Farr, representing the Rubber Association, and Prof. W. K. Hatt, of Purdue University.

PERSONAL MENTION

E. H. Cotterell has been appointed city engineer of McKinney, Texas.

R. W. Baker has been appointed county engineer for Howard County, Texas.

W. A. French has been appointed county engineer of San Augustine County, Texas.

E. C. Wenger has been appointed resident engineer on federal aid work in Finney County, Kansas.

V. B. Fredenhagen has been appointed resident engineer on federal aid work in Saline County, Kansas.

E. J. Terrill has been appointed resident engineer on federal aid work in Montgomery County, Kansas.

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The Pennsylvania State Highway Department has filed a number of applications for elimination of grade crossings on main highways with the Public Service Commission.

Jackson Hole, Wyoming, recently celebrated a community road building day. Men from the entire community turned out with shovels, picks, teams, scrapers and road building implements and improved 15 mi. of road.

The New Jersey State Highway Department has under consideration a claim filed against it by a farmer for $125, it being alleged that a heifer owned by the farmer died after eating a stick of dynamite left alonog the roadside by employees of the department while engaged in construction work on Route No. 9.

Five Persons were Drowned near East Hamburg, N. Y., recently when the automobile in which they were riding leaped from a bridge which was partially washed out. The bridge was washed out during a storm of the previous night and it is reported that no danger lights had been placed on the end of the structure on which the automobile entered. The victims of the accident were pinned under the machine in 10 ft. of water.

90°-

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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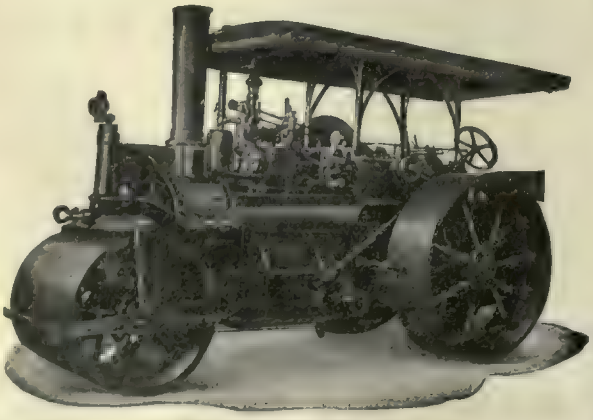

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX

JAMESTOWN, N. Y., AUGUST 25, 1920

Number
8

Old Railroad Bridge Converted into Highway Structure

Old Railroad Bridge over Thames River Converted Into Highway Toll Bridge by Connecticut State Highway Department—Unusual Method of Reconstructing Drawspan to Prevent Interference with Another Bridge

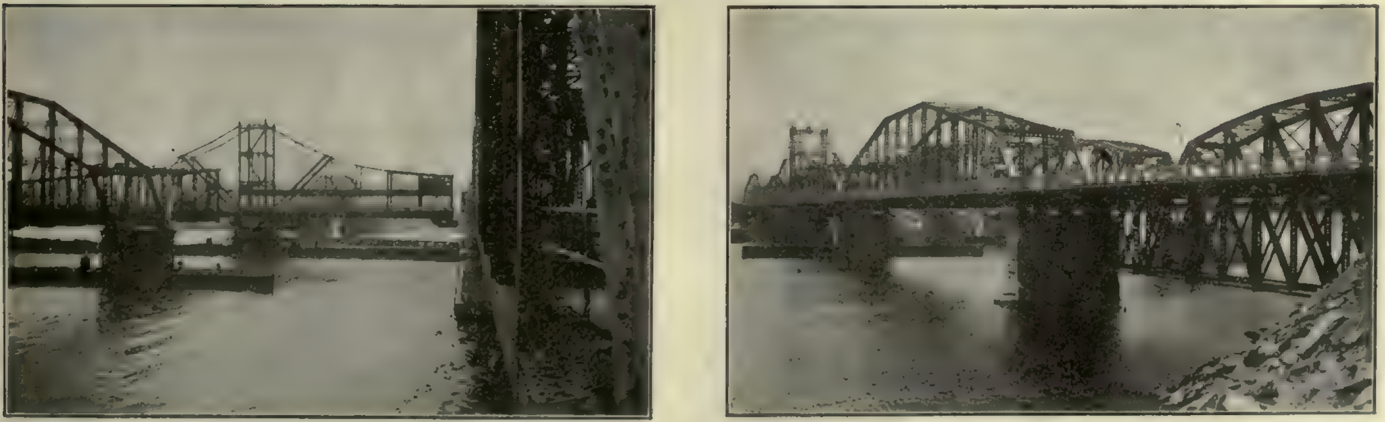
The Thames River Bridge between the City of New London and the Town of Groton, Conn., was originally built as a double track railroad bridge for the New York, Providence and Boston Railroad and was opened to traffic in 1889. The total cost of construction including land damage, etc., was about $1,300,000. The structure consists of two 100-ft. deck spans, two 310-ft. through spans and one drawspan 503-ft. long, making a total length of 1,323 ft. between end bearings.

Foundation conditions encountered were extremely bad, there being about 75 ft. of mud under 50 ft. of water. The piers were constructed on timber cribs resting on wooden piles about 75 ft. in length. Satisfactory service was given by the bridge until 1908, when, because of the excessive loads imposed upon the structure by the trains, it was decided to remove one track and place the other in the center of the bridge.

In 1918 the railroad decided to abandon the structure and use a new bridge approximately 250 ft. upstream. The old bridge was given to the Connecticut State Highway Department, gratis, and plans were immediately prepared for converting it into a highway structure.

The pricipal difficulty met with in the work of reconstructing the bridge was that it was impossible to swing the drawspan into the open position without bumping into the new structure. The plan finally adopted by the State Highway Department was to cut off about 94 ft. of the east end of the drawspan and cantilever the cut-off portion out from the adjoining span. To balance the drawspan a moving counterweight of approximately 300,000 lb. was designed traveling on a track fastened to the trusses far enough above the roadway to give a clearance of about 14 ft.

When the bridge is being used for highway traffic, this counterweight is directly over the center pier. Before opening the bridge the counterweight is



Drawspan Open

Groton End of Bridge

OLD RAILROAD BRIDGE BETWEEN NEW LONDON AND GROTON, CONN., NOW A HIGHWAY BRIDGE run out to the end of the short arm and the wedges withdrawn. The drawspan is then in balance and can be swung to the open position. The time taken for this operation is approximately 8 minutes.

The reconstructed bridge carries a roadway which is 23 ft. wide between curbs, and a 6-ft. sidewalk on the downstream side. The roadway is composed of two layers of planking, the lower being 3 in. thick, creosoted, and the upper layer being built of 2-in. long leaf yellow pine laid logitudinally. A single trolley track has been placed on the upstream side of the structure.

The total cost for reconstruction, land damage and completing the concrete approach, was $472,000. The bridge is now maintained and operated as a toll bridge by the Connecticut Highway Department.

Should the State Own and Operate a Plant for the Manufacture of Portland Cement?*

By **J. C. NAGLE**†

Because of a recital of my difficulties in securing cement for certain construction work at the Prairie View State Normal and Industrial College, the direction of this construction work being one of my duties, the president of our association has suggested that I present a paper bearing the title which heads this article. Beyond such facts concerning the scarcity of Portland cement during the first half of the year 1920 which came under my personal observation, the content of this paper has been derived from other sources. I do know personally, however, that for some cause or other it has been almost impossible to secure cement from the mills during the first half of the current year.

Early in the year we made requisition for several hundred barrels of cement and an order was placed for early delivery of a couple of hundred barrels, the remainder to follow as needed. It developed after the the order had been placed for some weeks that none of the five Texas mills could supply it at any definite date. It was reported that practically no cement was in storage. Two of the mills were short of fuel, one had a breakdown and another was shut down for the installation of additional machinery, and another was shut down part of the time for repairs. Shortage of fuel seemed to handicap practically all the plants.

As it was imperatively necessary that certain portions of the Prairie View work be done during the short interval between the close of the regular session and the opening of the summer school, we bought something over 200 bbl. of "scalper cement" at $7 and $8 per barrel and are now hoping that our order at the mill may be delivered some time during July, as now promised. Before paying the above outrageously high prices for cement, we tried over forty mills outside of the state directly, and had inquiries made of dealers in Birmingham, Kansas City and Chicago, but without unearthing any available cement except at one mill in San Francisco, which mill offered cement at $3.80 per barrel, in 25 ct. sacks, f. o. b. factory. As the freight rate to Texas common points was quoted to us at $23 per ton the above price, when augmented by the cost of carriage, became prohibitive.

From the foregoing negative results of our efforts to secure cement for immediate use it would appear that the situation in other states is about the same as that which obtains in Texas, and this impression is confirmed by information from other sources. I am inforced that efforts to secure cement from Italy, Cuba and Mexico have also been fruitless.

Domestic Production, Imports and Exports

In the April, 1920, issue of "Concrete" there is given a compilation, by the Division of Statistics, Bureau of Foreign and Domestic Commerce, showing "the imports, exports, domestic production, and average import and export prices for the calendar years 1914 to 1919" from which the accompanying table has been copied. It will be noted that the quantities imported are given in hundredweights while the domestic production and quantities exported are given in barrels. It was not stated whether a "hundredweight" was 112 or 100 lb. but the weight of a barrel is stated as being 376 lb.

If the same rate of exports obtained during the last three months of 1919 as during the preceding nine months, the total amount of cement exported during the calendar year of 1919 exceeded 2,386,000 bbl. The gain in exports since 1915 is ascribed to a gain chiefly in the trade with South America and the West Indies. From 1897 to 1907 the quantity of cement imported averaged more than 2,000,000 bbl. annually. In 1912 the imports amounted to only 68,503 bbl. By 1914 this had increased to 120,906 bbl. The European war cut off practically all imports.

Decreased low cost of production of domestic cements accounts for the reduction in imports. According to the reports of the U. S. Geological Survey, the average cost per barrel for production by 110 plants in 1914 was $0.927 and in 1915 the average for 106 plants was $0.86. This was the factory price for bulk cement.

(Continued on page 94)

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[*] Paper presented at the second meeting of the Texas Road Builders' Association, Austin, Tex., June 23-24, 1920.

[†] Dean, School of Engineering, Agricultural and Mechanical College of Texas.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX AUGUST 25, 1920 No. 8

PLANS FOR SNOW REMOVAL

The underlying truth in the exhortation about making war preparations during peace times can be applied profitably in a great many of the needs of government. Just now one of the matters that should be engaging the attention of road building authorities is keeping the highways open to traffic next winter.

While neither the climatic or the industrial conditions of next winter can be foreseen, it is quite safe to look forward to a demand for highway transportation at least equalling that of past winters. And it is the part of wisdom to make such preparation as can be made in advance, especially since nothing done along that line will be lost even if the coming season does not bring heavy snows.

One phase of the matter that can well be attended to now is the diverting of unused funds to snow removal and the purchasng of needed equipment. Snow removal, perhaps to a greater extent than any other kind of road work, is a matter of machinery. For that reason, its performance next winter should be comparatively free from one of the difficulties that have held back road work during the present construction season—the obtaining of labor.

Another part of the work on which much can be done now is ascertaining the routes that probably will require clearing, and planning the requisite distribution of forces and equipment.

It is certain that no intelligently directed effort made now will be wasted, and it probably will yield a decidedly worth-while return next winter.

THE NEED OF AN EQUITABLE PLAN OF MOTOR VEHICLE TAXATION

Distributing the cost of road construction in exact proportion to the benefits accruing—the only fair method of distribution—is obviously impossible. At the same time, a more equitable apportionment than is now made is by no means impracticable.

Since motor-driven vehicles constitute almost all of the traffic on the great majority of highways, it is evident that they are the chief factors in wearing out the roads. That this is recognized is shown by the practice of taxing them and using the proceeds for road work. It is also evident that the wear due to a car or truck varies with the weight of the car and its load, its speed, the mileage traveled, the size and kind of tires with which it is equipped, and a number of other factors.

Present methods of taxing cars take no account of one of the chief of these factors—mileage. One man buys a car and drives it a thousand miles in a year. Another man buys a car exactly like it and drives it ten thousand miles. Each pays the same tax, though one is responsible for at least ten times as much road wear as the other causes. Nearly all other costs of operation—gasoline, oil, tires, repairs and depreciation—are paid in proportion to the use, that is, the mileage. But the price paid for the use of the roads, without which, incidentally, the car would be useless, is the same in each case. The man who uses a thousand miles of road in a season, so to speak, pays as much as the man who uses ten ten thousand miles—or twenty thousand miles.

It is right to tax cars on a basis of value, just as other property is taxed. Levying upon them in some proportion determined by weight or horse power, or both, is an attempt to adjust the burden equitably, but it does not go far enough and is sometimes manifestly upfair. For instance, a light, low powered car frequently makes enough more mileage than a heavy, powerful one to cause far more wear on the roads it traverses than does the other on which a much higher tax has been paid.

In place of the present plan of taxation, then, there should be devised some method that, as nearly as possible, would adjust the tax to the amount of wear to which the vehicle subjects the roads. Devising such a method is an intricate problem, but by no means one that can not be solved in a way that will be an improvement over the present plan. The factors mentioned would have to be taken into account, and that would undoubtedly involve gasoline consumption as the basis of computation.

Should the State Own and Operate a Plant for the Manufacture of Portland Cement?

(Continued from page 92)

Preliminary estimates by the U. S. Geological Survey, as stated in the March, 1920, issue of "Concrete," indicate that production of Portland cement increased 13% during the calendar year of 1919, while exports increased 21% over those in 1918; and also that stocks of cement in storage decreased 52%, leaving less than 5,000,000 bbl. of cement in storage at the mills at the end of 1919. During 1917 slightly more than 90,700,000 bbl. of Portland cement were shipped, while in 1918 the quantity shipped was slightly less than 71,000,000, the decrease being largely due to war restrictions. During 1919 the shipments of cement amounted to nearly 85,500,000 bbl., the chief increase occurring during the latter part of the year. Production was estimated by the Survey at 80,287,000 bbl., which was more than 5,000,000 bbl. less than the shipments.

design of some road construction in the state on which it was planned to use concrete, but for which construction other types have had to be substituted because the needed cement can not be obtained. There is room now for another Portland cement mill in Texas, and with even reasonably probable increase in building and road construction there should soon be room for two. With a sufficient mill capacity to meet, or slightly exceed, the demand of the trade at all times it is only reasonable to expect the factory price to drop to such a level as will yield a fair and reasonable return upon the money invested in such plants over and above the cost of production. A plentiful supply will also put a stop to profiteering upon the part of dealers and others who may have secured a supply to be disposed of at prices far above the real market value as based upon the cost of production.

If the above reasoning is correct, the question is, would it be advisable or desirable for the state to build, own and operate a Portland cement mill?

PORTLAND CEMENT PRODUCTION, EXPORTS, IMPORTS AND PRICES

Calendar year	Imports (cwts.)	Exports (bbl.)	Domestic production (bbl.)	Average Price	
				imports (per cwt.)	exports (per bbl.)
1914	463,078	2,140,197	89,049,766	$0.417	$1.44
1915	100,390	2,565,031	86,708,448	.356	1.31
1916	6,855	2,563,976	92,363,335	.718	1.49
1917	8,829	2,586,215	93,453,658	.688	2.06
1918	1,146	2,252,446	71,514,629	1.030	2.66
1919*	31,807	1,789.612	———	1.600	3.00

*For nine months only.

The average price per barrel for cement in bulk at the factory ranged from $1.75 in Kansas to $2.03 in Utah, and the average for the whole country was $1.69 during 1919, an increase of 6% over 1918. The average value of cement exported during 1919 was $3.05 per barrel, which amounted to an increase in price of 16% over 1918.

Present and Future Demand

Since 1910 the demand for cement has steadily increased, the average rate from 1910 to 1917 being about 2,300,000 bbl. annually. The war checked this temporarily but during the latter half of 1919 and the first half of 1920 the consumption of cement in building trades, municipal and highway improvements has augmented the demand far in excess of the increase in production following the close of the war.

It has been estimated that the probable annual demand of the building trades in Texas will call for about 2,000,000 bbl., and that the requirements of our road building program will call for about 1,000,000 bbl. more per year. The combined output of the five Texas mills will, even with the recently increased capacity of one of them, probably fall short of this amount by 500,000 bbl. I know that lack of cement has resulted in causing changes in the

One of the questions which will naturally arise in attempting to answer the above question is that of cost. Another is, should the state enter into competition with private parties or corporations authorized by the state, by manufacturing or producing commodities of the same character. Only the question of cost will be here considered.

Approximate Estimate of the Cost of Constructing and Operating a 1,000-bbl. Capacity Cement Mill

The cost of producing a barrel of cement will depend upon a number of factors, among them location; cost of mining, combining and grinding the raw materials; the type and size of plant; kind and availability of fuel; etc., etc. Probably the smallest sized plant which can be economically operated is one of 1,000 bbl. per day capacity, or, say, 300,000 bbl. per annum. Suitable limestone and clay in close proximity can be found in a large number of localities in Texas, but the question of railroad facilities for shipping in fuel and shipping out the cement must be given due consideration in selecting the site. Also the proximity to the place of probable maximum consumption should also be considered.

I have fortunately been able to secure a very detailed estimate of the probable cost at the present time of constructing and operating a plant of the size here considered which I present in condensed form herewith:

Construction costs:		
Buildings	$165,000.00	
Machinery and power plant	300,000.00	
Quarry equipment	35,000.00	
Industrial tracks	15,000.00	
Total		$515,000.00
Interest at 6%, assuming 12 months for construction	$ 15,450.00	
Organization expense, assumed at 5%	25,750.00	
Contingencies, assumed at 10%	51,500.00	
Total		92,700.00
Total estimated construction cost		$607,700.00
Operation costs:		
Interest at 6% on $607,700.00	$ 36,462.00	
Depreciation at 5% on $515,000.00	25,750.00	
Labor and superintendence	100,000.00	
Fuel oil (100,000 bbl. at $3.50)	350,000.00	
Power (1 h. p. per bbl., or 1.5 ct. per K. W. hour)	81,000.00	
Repair parts and general supplies	45,000.00	
Total estimated annual operation cost		$638,212.00

Three hundred thousand barrels of cement produced for the above cost of operation would make the cost per barrel, at the factory, about $2.13. For an average train haul of 100 mi., assuming a two-line haul, the freight would amount to 60 ct. per barrel, making the total cost, on board cars at point of delivery, $2.73 per barrel. It has been practically impossible to secure firm quotations recently, but about two months ago I had tentative mill quotations for July delivery of $4.07 per barrel. If the value of the sacks be $1.00 per barrel this leaves $3.07 for the cement, but the mill reserved the right to bill out at the market price at time of delivery. I have been informed of other quotations comparatively recently at $3.18 per barrel. This would indicate that the profit per barrel probably ranges from 34 to 45 ct. if $3.50 oil is used in its manufacture. Until quite recently our Texas mills were operating with much cheaper oil.

It will be noted in the above estimate of the cost of operation that fuel is the largest single factor in the case. If cheaper fuel than oil at $3.50 per barrel is obtainable, or if a smaller quantity than one-third of a barrel of fuel per barrel of cement can be secured, a corresponding decrease in the cost of production will be effected. By reference to the quotations from the reports of the U. S. Geological Survey, as stated earlier in this paper, it will be seen that the factory prices during 1919 averaged $1.69 for the whole United States and that the lowest given for any state was $1.57 in Kansas while the highest was $2.03 in Utah. These figures would indicate that the computations given herein for Texas are about in line, because fuel and other costs are higher now than they were in 1919, on the average. By using ground coal or lignite for fuel, with the cement plant located close to the source of fuel, it is probable that the cost of producing a barrel of cement in Texas can be reduced to $2.00 or less, at the factory.

It is believed that one-third of a barrel of fuel oil per barrel of cement is none too much to allow for a plant as small as the one under consideration. In the March number of "Concrete," Ralph H. Coghlan, in an article entitled "Rationale of the Burning of Portland Cement Clinker," states: "Approximately 1,400,000 B. T. U. are required to produce a barrel of clinker," and Roy Cross, in Bulletin No. 15 of the Kansas City Testing Laboratory, entitled "A Handbook of Petroleum, Asphalt and Natural Gas," gives 135,000 B. T. U. as an average value of fuel oil per gallon. This would mean that one barrel of oil should suffice to burn four barrels of clinker. If this can be done with a plant producing only 1,000 bbl. per day, and if the other operating costs should remain as we have figured them, the cost per barrel of production would be reduced about 29 ct. To be on the safe side we had better stick to the quantity as heretofore stated in this paper.

It has been suggested that convict labor could be used to advantage in quarrying and for such other work as does not require skilled labor. There are so many angles to such a use of convict labor that the arguments on the question will not be attempted here. A dependable and sufficient supply of common labor, at reasonable living wages, will do much in the way of reducing production costs, however.

Effect of a State Owned Plant

Such a plant as we have been considering would not suffice to relieve the deficiency in our Texas supply altogether, but it would help, and if found to be more than self sustaining it could be enlarged or an additional plant could be built and operated. On the basis of 34 ct. per barrel profit, the net earning on 300,000 bbl. per annum would be $102,000 and on a basis of 45 ct. profit, these earnings would be $135,000. The principal effect of a state owned plant would, however, lie in its wholesome tendency to stabilize market prices and reduce fluctuations which, when excessive, are hurtful to both producer and consumer.

I leave it to each of you to decide whether or not, in your opinion, the state should own and operate a cement plant of its own and hope that what has been said may aid you in reaching a conclusion.

Pennsylvania Frees Turnpikes

The Pennsylvania State Highway Department has announced that an agreement has been reached for the purchase of 2 mi. of turnpike in Bucks County. The purchase price is $8,840 and will be divided equally between the state and the county.

The road is owned by the Bridgeton and Blooming Glen Turnpike Co. A 3-mi. section of toll road in the same county, between Bridgeton and Newtown was recently purchased for $7,000.

The Willow Street Turnpike in Lancaster County was recently freed, the county buying 2 mi. and the state and county purchasing jointly 4.3 mi. for $37,000.

Negotiations are under way for the purchase of the Limekiln Turnpike in Montgomery County and the Johnstown and Creamer Turnpike in Cambira and Indiana Counties.

University of Texas Offers Highway Engineering Scholarship

A scholarship with an annual income of $300 will be awarded each year by the University of Texas to a student specializing in highway engineering. The funds for this scholarship were given by J. G. Culbertson, Wichita Falls, Tex., a manufacturer of motor trucks.

Good Roads Campaign in New Zealand

The campaign for good roads in New Zealand is being carried on in all sections of the country and a royal commission has been appointed to report upon the construction of a road in the North Island, extending from Helensville to Hamilton, a distance of 120 mi. It is expected that other commissions will be soon appointed.

The Whakatane County Council has appropriated $729,975 for road work in that county. The roads built under this appropriation will make accessible important agricultural and grazing sections in the vicinity of the Bay of Plenty.

The Otamatea County Council has been authorized to purchase three trucks, two stone crushing plants, plows, scarifiers, and other equipment for the building of stone roads.

It is proposed by the Thames County Council to expend $311,456 for the building of bituminous roads.

Road Work in Wyoming County, New York

At a recent meeting of the Board of Supervisors of Wyoming County, New York, resolutions were adopted providing for the construction of the Java Center-Five Corners Road, at an estimated cost of $18,000, the county to pay $7,500 and the Town of Java the remainder. Resolutions were also adopted providing for the following highway work:

Sheldon Center—Frinks Corner Road, 1 mi., at an estimated cost of $12,000, of which the county will pay $5,000.

LaGrange—Covington Center Road, 1 mi. in Covington; estimated cost, $12,000, of which county will pay $5,000.

Bennington Center Road, .5 mi., at an estimated cost of $6,000, of which the county will pay $2,500.

Five Corners-Castile Drab School House Road, 1.33 mi., at an estimated cost of $15,000, of which the county will pay $6,500.

Pike-Hardys Highway, .5 mi. in the town of Pike, at an estimated cost of $6,000, the county to pay $2,500.

Gainesville-Hermitage Highway, 1.5 mi. in the town of Hermitage, to be built at an estimated cost of $18,000, the county to pay $7,500.

The petitions of the town of Perry to bond the town for $10,000 for the construction of the Perry Center-LaGrange Highway and the town of Gainesville to borrow $8,000 were both granted.

Missouri Roads Organiation Has Novel Bond Promotion Plan

The Missouri Good Roads Federation is carrying on an active campaign in behalf of the proposed $60,000,000 bond issue for improved highways in Missouri, to be voted upon at the November election.

In order to secure funds for this work, medallions or discs to be fastened on automobile radiators are being sold to motorists throughout the state for $2 each. It is planned to sell 50,000 of these discs in St. Louis County, 25,000 in Kansas City and proportionate numbers in the other districts in the state. The discs are about 4 in. in diameter, painted white with a red border, with a blue inscription, "Lift Missouri out of the Mud," upon the white center. Upon the border is the phrase, "Vote for Good Roads Amendment No. 6."

Banks, automobile organizations, retailers' associations and similar bodies are cooperating with the Missouri Good Roads Federation. It is thought that this method of promoting good roads will be of great value in stimulating interest for better roads in that state.

Campaign for Safer Highways

Safe Roads Federation of Massachusetts Conducting Educational Drive to Spread the Idea of Caution in Use of Highways

The Safe Roads Federation of Masachusetts is conducting an educational campaign in that state to reduce the number of accidents on the highways caused by careless driving and walking. This organization, which is formed by representatives of civic, insurance and motor bodies, has the cooperation of the state registrar of motor vehicles and the commissioner of public works.

Statistics will be compiled and various forms of publicity will be issued in carrying on the work. Newspapers and magazines will carry the message of safe highways, posters will be placed along the highways and printed matter of various kinds will be distributed through all posible channels. Moving pictures showing "near accidents" will be prepared and children in school will be taught to be careful in the use of streets and highways.

It is estimated that the work will cost $15,000 for the first year. The funds will be raised by voluntary contributions.

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

The Massachusetts Highway Commission held its midsummer meeting in Springfield on August 11 and 12. The night before meeting was held at Mt. Holyoke and on the next day the party was taken in charge by Mayor Adams, Superintendent Marsh and Assistant Superintendent Arthur Woodward of the Department of Streets and Engineering.

No business meeting was held, as the association members, who are city, county and state highway officials, preferred to chat with one another in groups in front of the Administration Building after having a group picture taken. After Mayor Adams had been hurried out of his office and had his photograph taken without the officials all were escorted to waiting automobiles parked in front of the Auditorium.

Promptly at noon the members left for an automobile tour of inspection and to study the bitulithic, asphalt, wood block, brick and other types of pavement used in Springfield. From the City Hall the highway officials went to Main St. and loked at the brick pavement made in 1893; thence to Locust St., Fort Pleasant Ave., Sumner Ave., Long Hill St., Long Meadow St. and through Longmeadow to the state line. They returned to the Forest Park entrance, through the park to Sumner Ave. and then toured the Water Shops and hill sections of the city. They inspected the city yards on Sumner St. and then went out St. James Ave. to the Fisk Rubber Co. plant, where luncheon was served. In the afternoon the highway officials inspected the plant.

News and Gossip

The Springfield Department of Streets and Engineering has had a busy week. On Aug. 12, was the Massachusetts Highway meeting and on the 15th, the outing of the department was held.

Despite the torrential downpour of rain and the electrical storm on the 7th, the annual clambake and outing of the Streets and Engineering Department at Riverside was pronounced the best "bake' the department has yet had. Employees, officials of the department, several other city officials and invited guests to the number of 400 journeyed to Riverside to take part in this annual event and they enjoyed a program of sports that was a corker from start to finish and a "bake" that was perfect.

The storm prevented a number of feature stunts that were scheduled to take place after eats had been disposed of but the rain failed to put a damper on the enthusiasm of the gathering. The clambakers had to stand on tables under the covered eating pavilion while the rain poured down, flooding the ground beneath. While they waited for the storm to blow over they cheered and sang themselves hoarse. After the storm blew over there was a grand rush for the refreshment stand and then because the condition of the ground prevented further sport, they headed for home.

It was about ten o'clock in the morning when the clambakers began to arrive and about eleven o'clock the sports program started. Handsome prizes were awarded in the different events. The bunch stopped long enough to pose for the camera man and launched an attach on the clams, chicken, corn, lobster, watermelon and other fine eats. The slaughter was terrible.

Then came the storm which put a crimp in the feature stunts which were to be staged.

Credit for the success of the "bake" is due to Albert E. Woodward and John J. Casey, who had charge of the arrangements.

The sport program was most capably handled by Carl Farmer as starter, R. F. Crafts as announcer and James Bongard, Horatio Converse and Crafts as judges at the finish.

Mayor Adams and the two other supervisors were unable to attend this year's "bake." City officials present were, Superintendent of Streets Robert P. Marsh, Department Superintendent Arthur H. Woodward, and the assesors, Wm. E. Sanderson and Geo. E. Mansfield, Jr. and Napoleon E. Russell of the Board of Public Works.

After many months of delay the Boston City Council has finally accepted the legislation act of 1917 which provides for the extension and widening of Stuart St. for the purpose of developing the land in the vicinity of Park Square. The act provides that the city's liability shall not exceed $250,000. The balance of the expense for the improvement is to be paid for by the real estate interests benefited by the changes.

Tax rates are increasing in practically every Massachusetts city and town.

In Winchester it was announced that the rate for 1921 would be $22 or an advance of $1.80 over last year but there is a little joker in this, as the selectmen, in an effort to keep the rate down, have increased valuation about 25%. This means that the charges will be equivalent to a $27 rate.

The valuations in the town have been increased $4,391,000.

The City of Newton tax rate will be $27.20, the highest ever established.

The tax in Woburn is increased to $26 which is $1.70 more than last year's rate.

The new Stoneham rate is $30.30 an increase of 70 ct.

In Lexington there is an increase of $6.40, bringing the total tax to $33 which is the largest in the history of the town. The town appropriations for 1920 exceed those of 1919 by $90,000.

The Brookline rate is increased 80 ct., to a total of $17.30.

Four elm trees on Cabot St., Beverly, two more than 100 years old, are being removed by the Public Works Department. New buildings are being erected on the street and the trees are in the way.

We regret to note the recent death of Fred W. Dow, one of the best known water works experts in New England. Mr. Dow had been ill for three months. He was connected with Medford's Water Department for more than thirty years.

The following revision of the schedule of permit charges now in use by the Park and Recreation Department of Boston has been approved by Mayor Peters, so that it will conform to the schedule of the Public Works Department:

1. Openings in roadways, walks or grounds, 50 ct. each, limited to 100 ft. on one permit.
2. Emergency permits (for above purpose), 50 ct. each opening.
3. Cleaning snow from roofs (occupation of sidewalk and street while so doing) annual permit $1.
4. Teaming or trucking on park roads, $5 per day.
5. Erecting and repairing awnings (annual permit.) $1.
6. Occupation of streets or sidewalk, erecting, altering or repairing buildings, 2 ct. per square foot per month, up to 5,000 ft., the minimum charge to be at the one month rate.
7. Painting or minor repairs, $1 each.
8. Moving buildings in streets, $5 per day; minimum charge, $10.
9. Placing and maintaining gasoline dispensers, not including signs (annual permit), $50.
10. Special permits for other than above purposes, $1 each.
11. Annual permits at rates other than those in the preceding classes, when in the opinion of the commission such permits are requisite to proper conduct of the permit system.

All extensions will be considered renewals and the charge collected for a new permit.

John J. Irwin, veteran of the World War, who served with the mine layers in the North Sea, has been confirmed a member of the Boston Street and Water Commission for one year.

Excellent progress is reported by the county commissioners relative to the construction of the new bridge between Springfield and West Springfield. The commissioners recently visited the West Side approach to the new structure and were struck particularly with the work in the river in connection with the foundation of the piers.

Apparatus and material long delayed on their journey to this city for use by the contractors have arrived in great part. Chairman Charles C. Spellman said that hardly at any time since the bridge contract has been awarded did the outlook so please the commissioners.

It will be a number of weeks before the appraisers to be selected for the valuing of the land to be taken by the county under the law for the use of the West Side approach to the structure can make a report. Those concerned were heard by the commissioners last week and the number indicates that the total amount of the damages to be disbursed will be large.

In last month's issue we started with a traveler overland from Boston to New York in 1788 and went with him to a point between Spencer and Brookfield. In this installment the trip is continued through Springfield to Hartford, Conn.

> From Spencer to Brookfield is 15 mi. The road is good as far as this last town. A town, you know, in the interior of America, designates an extent of 8 or 10 miles, where are scattered 100 or 200 houses. This division into towns is necessary for assembling the inhabitants for elections and other purposes. Without this division, the inhabitants might go sometimes to one assembly and sometimes to another, which would lead to confusion. Besides, it would render it impossible to know the population of any particular canton; this serves for the basis of many regulations. No people carry their attention to this particular so far as the Americans.
>
> The situation of Brookfield is picturesque. While breakfast was prepared, I read the gazettes and journals, which are distributed through all the country. Our breakfast consisted of coffee, tea, boiled and roasted meat; the whole for ten pence, New England currency, for each traveler. From this place to Wilbraham the road is covered with rocks and bordered with woods. At this place, a new proprietor, and a new carriage. A small light carriage, well suspended, and

(Continued on page 100)

New Hampshire Goods Roads Association

OFFICERS FOR 1920

WINFRED M. CHAPLIN, President .... Keene
WM. J. MORRISON, Secretary and Treasurer .... Keene
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The old wooden Amoskeag Bridge crossing the Merrimack River at Amoskeag Falls has collapsed and is resting on the rocks in the bed of the river. The bridge was 750 ft. long and was built in 1854. It has been closed to traffic since July 19, 1919.

One of the water mains supplying that side of the river and two cable lines of telephone wires were carried away.

It is estimated that on Sunday Aug. 9, New Hampshire motorists spent about $35,000 for gasoline to drive their cars an estimated total mileage of 1,000,000 mi., based on the asumption that 20,000 of the 33,000 and more automobile owners traveled an average of 50 mi. and used 5 gal. of "gas" each for their Sunday outing. These figures were made by a person who travels thousands of miles each month in a motor car and who visited the beaches and touched the Lake Winnipesaukee and White Mountain regions.

The "Union-Leader" correspondent was told that probably the heaviest traffic of the season over New Hampshire highways was recorded. The correspondent's informant regarding the throngs of motorists on the roads said that he was told by a resident on the road between Manchester and Franklin that over 200 cars went north during one hour in the morning. From another direction comes the story that a wayside resident counted 186 cars in an hour passing a point on one of the roads leading to the beaches.

Drivers of cars who made the trip from this section to the Sunapee Lake region reported that the traffic was apparently the heaviest it has been any day this season.

Added to the exceptionally large number of New Hampshire cars on the roads there have been, it is estimated, thousands of Massachusetts machines in the state, the greater part of which visited the beaches near Portsmouth.

It has been estimated that the number of motor cars in use by hotel guests in the mountain and lake regions of New Hampshire is a least 25% greater than last season.

A serious and probably fatal accident happened recently when a section of the wooden bridge over the Piscataquag River near New Boston fell under the weight of a heavy truck.

The machine fell 20 ft. to the river bed and the driver was pinned under the steering wheel, receiving injuries that may result in his death.

The bridge broke through as soon as the front wheels of the truck passed over it, and there is nothing of it left standing but a small section on the east side.

The structure, from what can be learned, had been unsafe for traffic for some time. The beams and planking were decayed in places and, according to persons who have used it lately, the bridge creaked even when a light touring car or horse and team passed over it.

Frederick A. Gardner, of Franklin, United States Forest Supervisor, in charge of the White Mountain National Forest at Gorham, has been selected to take charge of the forest exhibit car which will tour all the Eastern States. The car will be fitted with a forest exhibit and it is intended to advertise the recreational feature of all the eastern forests. Mr. Gardner will give addresses referring to the exhibit.

Frank A. French has just returned from an inspection of the marking of the Roosevelt International Highway in its course through this state and reports completion of the trail markings. The sign is a wide red band with a narrow white band above and below with the letters T. R. in black on the red.

The signs may now be seen all the way from Portland, Ore., to Portland, Me., and already tourists are making portions of the tour and some this season will take the entire route for their vacation trip.

In New Hampshire the route covers a most wonderful section of the state, entering from the west at Littleton and passing out into Maine at Conway. In this course the tourist sees our whole cross-section with the big range of mountains and including the marvels of Crawford Notch.

The T. R. band is an interesting marker, and, as the highway keeps to the northern boundary of the United States all the way from coast to coast, it seems quite appropriate to accept the slogan, which the association is using through "America's playgrounds."

Sometime in August a convention will be held, probably in Duluth where the National Headquarters are maintained. The New Hampshire Division is organized with Hon. John C. Hutchins, of North

Stratford, as chairman and Mr. French as the secretary. A campaign is soon to be instituted to enroll a thousand members in the New Hampshire Division. These memberships are $2 annually and the money is to be used to give publicity to the New Hampshire features with the purpose of inducing thousands of tourists who never saw the White Mountains and the "Switzerland of America" to motor into the Granite State. Once they do, a return trip is almost a surety.

State Commissioner of Highways Frederick E. Everett, City Commissioner of Streets of Concord Orrin W. Head, and Chairman Ervin W. Porter, of the Retail Division, were guests of the Board of Directors at a recent meeting, when the main topic of discussion was that of the local streets and of the roads leading into Concord. Limited appropriations and other difficulties had retarded work that should be done, it was explained. That condition was found to be the same in all cities throughout the country after the war period.

Mr. Porter explained that the merchants of Concord desired the best possible roads leading into Concord, and that the farmers wished good roads so that they could market their produce more easily.

State Commisioner Everett has awarded a contract for a section of 1,000 ft. of concrete roadway to be built in the City of Concord. The work was awarded to J. E. Narmandeau and the price is to be $4.89 per square yard for the completed road.

The State Highway Department has awarded a contract to the United Construction Co., of Albany, N. Y., for building a 121-ft. span steel bridge in the town of Winchester.

On account of the high cost of materials and the difficulty in securing labor and supplies, several New Hampshire Federal Aid road projects have been abandoned for the season.

We regret to report the defeat of the State Highway Department's baseball team at the hands of the State Forestry nine by a score of 9 to 5. We have it on good authority that the Forestry team was composed principally of ringers.

The Board of Water Commissioners of Manchester has accepted the proposal of Superintendent Hames H. Mendell to throw a 12-in. main across the McGregorville Bridge to insure adequate water supply to Amoskeag Village in the event the old Amoskeag Bridge should be destroyed and thus break the water connection which at present is carried across the old structure.

Details of the plan are being rapidly worked out and it is expected that the changes, including several other water mains to be placed in the North End, will be completed early this fall. These plans were hardly made in time, as the old bridge has already collapsed.

Franklin was recently visited by a terrific rain storm which caused considerable injury to the city streets and sidewalks.

Commander E. R. Brownell, of Portsmouth Navy Yard, has returned from a visit to Washington where he interviewed Secretary Daniels of the Navy Department in regard to the proposed bridge between Portsmouth and Kittery, Me. He has with him the approval of Secretary Daniels of the plans, as drawn up by the bridge commission of which Gov. Bartlett is a member.

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News and Gossip

(Continued from page 98)

drawn by two horses, took place of our heavy wagon. We could not conceive how five of us could fit in this little chariot, and demanded another. The conductor said he had no other; that there were so few travelers on this part of the road, that he could not afford to run with more than two horses; that most of the travelers from New York stopped in Connecticut, and most of these from Boston at Worcester. We were obliged to submit. We started like lightning and arrived in an hour and a quarter at Sprngfield, 10 miles. This road appeared really enchanting. It seemed the whole way to be traveling in one of the alleys of the Palais Royal. This man was one of the most lively and industrious, at the same time the most patient, I ever met with. In my two journeys through this place, I have heard many travelers treat him with very harsh language; he either answers not at all, or answers by giving good reasons. The greater part of men of this profession, in this country, observe the same conduct in such cases; while the least of these injuries in Europe would have occasioned bloody quarrels. This fact proves to me, that, in a free country, reason extends her empire over all classes of men.

Springfield, where we dined, resembles an European town; that is, the houses are placed near together. On a hill that overlooks this town is a magazine of ammunition and arms belonging to the State of Massachusetts. This is the magazine that the rebel Shays endeavored to take, and was so happily defended by General Shepard. We set out from Springfield after dinner for Hartford. We passed in a ferry boat, the river that washes the environs of Springfield.

I have passed twice through Hartford, and both times in the night; so that I cannot give an exact description of it. It is a considerable rural town; the greater part of the inhabitants live by agriculture; so that ease and abundance universally reign in it. It is considered as one of the most agreeable in Connecticut, on account of its society.

The environs of Hartford display a charming cultivated country; neat elegant houses, vast meadows covered with herds of cattle of an enormous size, which furnish the market of New York and even Philadelphia. You there see sheep resembling ours; but not, like ours, watched by shepherds and tormented by dogs; hogs of a prodigious size, surrounded with numerous families of pigs, wearing on the neck a triangular piece of wood invented to hinder them from passing the barriers which inclose the cultivated fields; geese and

(Continued on page 101)

New York State Road Builders' Association

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Crusher Run

At last the contract for the construction of the Great Western Gateway Bridge, connecting Schenectady and Scotia, has been let by the New York State Canal Board. The contract was awarded to the American Pipe & Construction Co., of Philadelphia, Pa. The bid was for $961,963, exceeding the engineer's estimate by approximately $300,000. In order to pay for the work it will be necessary to have the next Legislature appropriate an additional $300,000.

The American Pipe & Construction Co., to which the contract for the Great Western Gateway Bridge was awarded, is a member of the New York State Road Builders' Association.

Mr. Charles Van Amburgh, Third Deputy of the New York State Highway Department, is a guest at the Mountain House, Saratoga Springs, N. Y.

The Thew Shovel Co., an Ohio Corporation, has acquired all the outstanding capital stock of the Thew Automatic Shovel Co., of Lorain, O., and the two companies have been consolidated. The Thew Shovel Co. has assumed all the assets and business of the other company, together with the legal liabilities and obligations. The consolidation gives the Thew Shovel Co. net assets of $2,000,000, and it is planned to increase the productive capacity of the company at least 100% during the year 1920. The Thew Automatic Shovel Co. is an associate member of the New York State Road Builders' Association.

Paul McLoud, of Albany, N. Y., has received the nomination for state engineer on the Democratic ticket. Mr. McLoud was chief engineer in the New York State Highway Department during the years 1913 and 1914, until the outbreak of the war. Mr. McLoud was cited for personal bravery and offered a British decoration, which he declined on account of the United States regulations.

President John H. Gordon has issued a circular letter to the members of the New York State Road Builders' Association, asking them their opinion as to whether or not the Highway Department should be asked to advertise additional new construction this fall.

There were 9 roads advertised at the letting which took place on Tuesday, Aug. 10. Five were repair contract jobs and four completion jobs. The repair contracts were in Dutchess, Oneida, Schuyler, Yates and Cattaraugus Counties. There was no bid received for making repairs to Part 2 of the Albany-Schenectady Road, Albany County. The completion work was in Wayne and Onondaga Counties. No bid was received on Westport-Elizabethown Road in Essex County. This is the contract which was started by the Joyce Construction Co., of Albany, N. Y.

The following were low bidders at this letting: Kennedy Construction Co., Repair Contract No. 1285, Albany County, $83,935.00; McCarthy & Rock, Repair Contract No. 1248, Oneida County, $39,518.75; Wm. Hazard, Repair Contract No. 1284, Schuyler and Yates Counties, $8,293.35; Forness & Fote Co., Repair Contract No. 1283, Cattaraugus Co., $58,730.36; M. H. Ripton, Completion Contract No. 1359, Onondaga County, $7,172.29; John Johnson Construction Co., Completion Contract No. 5660, Onondaga County, $87,220.90; Floyd H. Wells, Completion Contract No. 5653, Wayne Co., $84,893.65.

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News and Gossip

(Continued from page 100)

turkeys in abundance, as well as potatoes and all other vegetables. Productions of every kind are excellent and cheap; the fruits, however, do not partake of this excellent quality, because they are less attended to. Apples serve for making cider; and great quantities of them are likewise exported.

To describe the neighborhood of Hartford is to describe Connecticut; it is to describe the neighborhood of Middleton, of New Haven, etc. Nature and Art have here displayed all their treasures; it is really the paradise of the United States. M. de Crevecoeur, who has been so much reproached with exaggeration, is even below the truth in his description of this part of the country. Read again this charming picture, and this reading will supply the place of what it would be useless here to repeat.

This state owes all its advantages to its situation. It is a fertile plain, inclosed between two mountains, which render

(Concluded on page 102)

MEETINGS

Calendar of Coming Meetings

August 24-26.—League of Cities of the Third Class in Pennsylvania.—Annual Convention, York, Pa. Secretary, Fred H. Gates, City Clerk, Wilkes-Barre, Pa.

Aug. 25-27.—Union of Nova Scotia Municipalities.—Annual Convention, Windsor, N. S., Canada. Secretary, Arthur Roberts, Town Solicitor, Bridgewater, N. S.

Sept. 1-3.—Michigan State Good Roads Association.—Annual Meeting, Lansing, Mich. President, P. T. Colgrove, Hastings, Mich.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

PERSONAL MENTION

Henry Maetzel has resigned as city engineer of Columbus, O.

James Pigman has been appointed city engineer of Dalhart, Texas.

L. C. Gilliam has been appointed city engineer of Eagle Pass, Texas.

Louis Laging has been appointed city engineer of San Angelo, Texas.

W. E. Anderson has resigned as city manager of Brownsville, Texas.

Jack Ardis has been appointed city engineer of Sulphur Springs, Texas.

Paul A. Paulson has resigned as superintendent of highways of Fayette County, Pennsylvania.

Frank C. Rush has been appointed superintendent of highways of Fayette County, Pennsylvania.

A. V. Helms has been appointed resident engineer of Federal Aid Project No. 41 in Franklin County, Kansas.

Dudley Atkins has been appointed resident engineer on Federal Aid Project No. 53 in Doniphan County, Kansas.

F. P. Adams has resigned as city engineer of Chatham, Ont., Canada, and is now city engineer of Brantford, Ont.

O. S. Petty has been appointed associate professor of civil engineering at the University of Texas, to succeed R. G. Tyler.

E. E. McAdams, formerly with the engineering department of the Agricultural and Mechanical College of Texas, is now city manager of Bryan, Texas.

C. D. Young, Vice President of the American Society for Testing Materials, has been appointed representative for that body on Engineering Council.

R. G. Tyler, formerly Associate Professor of Civil Engineering at the University of Texas, is now city engineer of Paris, Texas, at a salary of $6,000 a year. Mr. Tyler is president of the Texas Road Builders' Association.

Ralph R. Benedict, formerly Assistant Superintendent of Parks of Kansas City, Mo., and for the past two years with the Ordnance Bureau of the War Department at Washington, D. C., has been appointed assistant to the chief highway engineer of Illinois.

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News and Gossip

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difficult its communications by land with the other states. It is washed by the superb river Connecticut, which falls into the sea and furnishes a safe and easy navigation. Agriculture being the basis of the riches of this state, they are here more equally divided. There is here more equality, less misery, more simplicity, more virtue, more of everything which constitutes republicanism.

Connecticut appears like one continued town. On quitting Hartford you enter Wethersfield, a town not less elegant, very long, consisting of houses well built. Wethersfield is remarkable for its vast fields uniformly covered wtih onions; of which great quantities are exported to the West Indies. It is likewise remarkable for its elegant meetinghouse or church.

Other proofs of the prosperity of Connecticut are the number of new houses everywhere to be seen, and the number of rural manufactories arising on every side, of which I shall speak hereafter. But even in this state there are many lands to sell. A principal cause of this is the taste for emigration to the western country. The desire of finding better, embitters the enjoyments even of the inhabitants of Connecticut. Perhaps this taste arises from the hope of escaping taxes, which though small, and almost nothing in comparison with those of Europe, appear very heavy. In a country like the United States, everything favors the forming of new settlements. The new-comers are sure, everywhere, of finding friends and brothers who speak their own language and admire their courage. Provisions are cheap the whole way, they have nothing to fear from the search of custom-house clerks, on entering from one province to another, nor river tolls, nor imports, nor vexations; man is free as the air he breathes. The taste for emigration is every day augmenting by the accounts in the public papers of the arrival of different families. Man is like sheep everywhere: he says, "Such an one has succeeded, why shall not I succeed? I am nothing here, I shall be something on the Ohio; I work hard here, I shall not work so hard there."

(To be continued)

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The New Jersey State Highway Department has turned over to the City of Gloucester, the thoroughfare, Broadway, running through the city. This street was recently taken over as a part of Route No. 6 of the state highway system. The city will now undertake the repair of the street.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX

JAMESTOWN, N. Y., SEPTEMBER 1, 1920

Number
9

Shell Roads

Value of Shell as a Road Building Material—Kinds of Shell Employed—Occurrence and Methods of Production—Methods of Construction and Maintenance—Bituminous Treatment Practice

By J. M. WISE*

For about fifteen years the writer has been handling shell as a road material. He has seen the much lauded shell roads of ten years ago practically disappear under present day traffic. He is satisfied that as a material for the wearing surface of main traveled highways shell is not a suitable nor economical material, but as shell is practically the only road material indigenous to the Texas Gulf Coastal Plain, it should not be unqualifiedly condemned. A well finished shell road gives a surface smoother than asphalt, and under light traffic, this surface can be satisfactorily maintained, but under heavy traffic the maintenance becomes prohibitive.

Before going into detail it may be well to dispel an apparent misunderstanding as to what "shell" is. Generically, the unmodified noun covers several classes of material which differ greatly in road building qualities and in the methods of placing.

Probably the best, and certainly the scarcest, are the oyster shells from oyster "shuckeries" and canneries. These are fresh "live" shell, hard and tough, that when consolidated into a road surface will stand up under fairly heavy traffic. The method of using them was developed by the Maryland

SHELL ROAD TWO YEARS OLD, BETWEEN HOUSTON AND GALVESTON, TEXAS—SURFACE TREATED WITH TEXACO ASPHALT

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*Howe & Wise, County Engineers of Harris County, Texas.

State Highway Department and is well covered by our own state highway specifications.

Next in importance are the clamshells, which are found in banks on the shores of interior bays and estuaries. These bank deposits are usually too limited in quantity to justify the installation of mechanical handling devices, so that their use is limited to construction within motor truck hauling distance. Dredging operations near the shores of some of the shallow bays have developed the fact that there are large quantities of clamshell that can be made available by this method. So far, dredging of clamshell as an industry has not been resorted to, but it can not be long before something is done along this line.

Clamshells, being very hard and fairly tough, make a good road material. The famous shell roads around New Orleans are of clamshell. As they come from the bank they usually carry some filler material. If filler material is lacking, it must, of course, be supplied. Rolling is advantageous, but practically as good results can be obtained by continuous dressing with a grading machine until the road has set up.

The great bulk of the shell road construction is done with reef shell. This is broken up, partially decayed oyster shell found in reefs in the coastal bays. It varies in quality in different reefs and even in different parts of the same reef. In places in the reef it is mixed with considerable sand and blue mud. In the early days of the industry the shell was excavated with a dipper dredge and a considerable content of mud accompanied the shell. In fact, experienced road builders preferred to use it at about the consistency of quaky concrete. Careless dredging, with consequent excess mud, brought about specifications limiting the mud and sand to not more than 30%.

The suction dredge supplanted the dipper dredge and not only produced a product that complied with this requirement, but produced it more economically. The suction dredge, however, introduced a new trouble—it made the shell too clean. No binder at all is nearly as bad as too much. Attempts to hold part of the filler in the shell by regulating the overflow gates on the barges so as to give a longer setlement period produced a sand instead of a clay filler. This formed in pockets and proved very detrimental. Possibly the dredging companies can better this condition, but as the demand exceeds the present rate of production, there is not much chance of their doing anything for the present.

The method of building reef shell roads seems exceedingly primitive. The shell is dumped from wagons and spread with shovels or hoes. Spreading with a grading machine is unsatisfactory, as it makes a lumpy road. Rolling is useless, as the particles of shell are flat, or nearly so, and break up under the roller instead of wedging and compacting. Accepted practice is working with a blade grader daily for ten days or two weeks and then, as required, keeping ruts filled until the road sets up. The time required to accomplish this depends upon the traffic and weather conditions. After a shell road has once set up the wear takes the form of potholes and cross ridging or wash-boarding.

Repair work, when taken in time, can be done with a blade grader, operated during or immediately after a rain. Patching small holes with the kind of material that is being furnished now is not very satisfactory. The shell is too clean and will not stay in the holes. Deep holes can be filled with more success. The material is very soft and wears rapidly, forming quantities of fine white dust and requiring frequent resurfacing when the traffic is heavy.

Appreciating the weakness of the wearing surface much experimenting was done to try to strengthen it. Harrowing washed or nearly clean gravel, 1-in. and smaller, into the surface has helped materially and is now an accepted form of construction. Efforts to toughen the shell by penetration applications of asphalt and by harrowing the asphalt into the surface of the shell and then rolling were unsuccessful, as were also the first attempts at mat surface applications. Perseverance in experimenting on the mat surface work has finally developed methods that are reasonably successful. Both one-coat and two-coat methods are being used. In the two-coat work, the first applications of light oil is 0.3 gal., followed, after a short period for setting up, by 0.3 gal. of heavy oil. With one-coat work, 0.5 to 0.6 gal. of heavy oil is applied.

Owing to the fineness of the shell dust particles and the possibility of dust pockets in the surface, it is very essential that the sweeping and cleansing of the surface be thoroughly done. A clean surface is even more important on shell than on gravel, as there are fewer projecting surfaces to which the bitumen can adhere.

The cover material is important. The best results have been obtained from trap rock passing a 1-in. screen and retained on a ¼-in. screen. Larger sizes of stone were tried, but were not as satisfactory, owing to inability to get the voids filled. Graded gravel, from ¾ in. down, does fairly well; and limestone, put on a year ago, has, up to date, given good results. Sand as a cover was unsatisfactory.

Retreatment is necessary in from 12 to 18 months on tar treated roads, owing to the loss of elasticity of the surface materials. Where asphalt is used, the frequency of retreatment is more nearly proportional to the traffic, ranging from 12 months to 3 years.

An unfortunate feature of treatments has been the unexplained lack of uniformity in results where apparently identical conditions prevailed. Careful study of the failures may give information that will prevent them in the future. Apparently, surface treating can be done successfully on shell roads

(Concluded on page 116)

How to Improve and Maintain Earth, Clay and Sand Roads*

By A. R. HIRST†

I have been asked to cover, in a total of about 2,500 words, the most important and difficult portion of the highway program of any country. This is about like asking a man to compile an adequate dictionary, but not to define more than 1,000 words. My talk will, of necessity, be sketchy and incomplete, for to properly cover the subject would take thousands of words, while I have been limited to a few hundred.

However, if I can in these few words impress upon you a few basic facts in regard to earth roads, I will probably have accomplished the purpose of the program makers.

Roads made only of the natural earth of the various localities, with such little adjustments in the composition of their surfaces as may be made by the work of man, will comprise probably for all time, in Canada and in the United States, a very large percentage of the total highway mileage.

On these roads there will originate a very large share of the total traffic using the more adequately improved county highways, provincial or state highways, and national highways. Acre for acre, the lands in a given locality produce about the same tonnage and, therefore, mile for mile, the agricultural production on the highways is, roughly speaking, an equal amount.

While systems of national highways, systems of provincial or state highways, and systems of county highways will probably ultimately be improved with adequate surfacings, a large portion of these systems, and practically all local roads, are now, and for years to come will be, earth roads. Their composition will be the natural soil, as deposited by nature or as modified by man.

Some of these natural soils have been by nature mixed exactly right so that they may be maintained with drags, road planers, or road machines (blade graders) and give for a very large percentage of the time very adequate and excellent service. These roads are usually in soils which have been called sand clay loams, whose texture is not so sandy that it gives a surface which cuts up readily, and not so clayey that it gives a surface which becomes slippery and ruts badly or holds water in wet seasons. On roads of this class, given proper drainage and a proper cross-section, maintenance is a simple matter. The intelligent and persistent use of an adequate smoothing tool as soon as possible after each rain and a proper amount of care to keep the ditches and waterways clear will insure a road structure adequate in many places for even moderately heavy traffic.

Lighter than the loams above described are the sandy loam soils which should be treated in the same general manner but which, on account of their more unstable character, will often require light applications of clay in order to keep them from getting mealy. Where such roads are not standing up after proper regrading and proper maintenance, clay of a proper character should be added in small quantities, an inch or two at a time, and the surface worked and reworked until stability is secured.

Next down the scale are the roads consisting of actual uncombined sand, which are totally hopeless if not properly handled.

Unless a real improvement is to be made in a sand road, the less it is disturbed the better it will be. Nothing is more annoying than to try to pass over a piece of sand road which has been recently graded or smoothed so as to fill ruts previously several inches deep with loose dry sand. Until funds are available to do something worth while with these roads, they should be left severely alone.

There is one exception to this general rule. Quite often there is a top soil deposit overlying the real sand. In many cases sand roads are sandy because this top soil has been cut through or worn out and the use of a road machine to bring in new top soil from the sides to cover the worn-out roadbed will work wonders. But don't cut through the sand. The top soil only is of value.

If it is the only remedy available with the funds, sand roads should be shaped and brought up slightly with a blade grader and a temporary covering of some fibrous material should then be applied. Cedar bark or cedar shavings, marsh hay, rye straw and pine needles have been used for making these fibrous applications. The material should be spread to a loose depth of about 6 in. in a trench which has been opened to receive it, and the sand which has been thrown out should then be moved back on top of the fibrous material to protect it, in some degree, from the traffic. Our experience is that these fibrous coverings when lightly buried last at least twice as long as when left uncovered and exposed to the direct wear of traffic.

These coverings will, if properly handled and properly covered, usually last one season except on very heavily traveled roads. They do not make boulevards, but they do make passable roads at a very reasonable expense.

Some three years ago we tried in Wisconsin the building of mats consisting of marsh hay or rye straw impregnated with tar. We tried several methods of doing this but found that the best method was to open the trench, spread about 4 in. of marsh hay carefully, apply ½ gal. of tar, cover adequately with sand; then spread a similar thickness of marsh hay, cover with ½ gal of tar, and again with sand. We were able to build up in this way a quite resistant mat which, on a road of moderate traffic, gave excellent service for over a year. Marsh hay produced somewhat better results than rye straw.

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*Extracts from a paper presented at the seventh annual convention of the Canadian Good Roads Association, Winnipeg, Man., June 1-3, 1920.

†State Highway Engineer of Wisconsin.

Not to go into details (which will be found in our last biennial report, 1918) while these tar mats give quite excellent surfaces, they were too expensive for the length of service secured. Such a covering would cost, at present prices, probably at least $1,000 per mile for a surface 16 ft. wide.

We, therefore, gave up the idea of using tar mats and have devoted all of our energy to covering sand with clays and gravels. We find that the application of 3 to 5 in. of good binding clay, well mixed with the sand, will, if property mixed and maintained, give in a very few months a very satisfactory road on even the deepest sands. The cost per mile varies, of course, with the distance of the clay deposit from the road, but we are convinced that it is a much better investment to cover sand with clay or gravel, almost regardless of cost, than it is to bother with temporary fibrous surfacings. Clays used in modifying sand roads should be clays which, when made into balls and dried until hard, will not dissolve too quickly when immersed in water. Usually the longer the period necessary to dissolve the clays the better the clay for use in combination with sand, provided always that the clay as it occurs naturally can be pulverized when dry and mixed with sand.

Going up the scale from the ideal earth road, (the sand clay loam) we come next to the moderately heavy clays—clays which rut rather badly but which do not usually become excessively slippery. These clays should be drained and given a proper cross-section and then if they verge upon slipperiness after rains, should be given light treatments of sand until the texture of the surface is such that it can be traveled in wet spells without sliding all over the crown.

In general, the result is practically the same as upon the clay-impregnated sandy loams, but the clays are more difficult to maintain because the drainage conditions are worse. Given sand applications from time to time until the proper surface is secured, they make quite satisfactory roads.

The next and final class comprises the heavy clays and mucks. These and the loose sands constitute the real "enfants terrible" in the earth road family. Given a proper application of a smoothing tool the other three broad classes of earth roads will give good service. But nothing in the way of smoothing will make wholly adequate a road of real sticky clay or muck which is rough and dusty in dry seasons, a quagmire in wet seasons, and a nuisance at all times. These roads should be especially well drained and be graded to adequate widths, at least 30 ft. between the ditches. The ditches should be cut well below the crown and the top of the grade should be quite flat. Places often becoming impassable should be carefully graded and well drained, either with stone drains or tile underdrains. It is often a very small percentage of the total length that renders clay roads impassable at certain times. The adequate treatment of this small percentage will often make a wonderful improvement in the general condition and passability along their whole length.

If a satisfactory earth road is to be secured upon these soils it is, in our opinion, absolutely necessary to surface them with sand or sandy gravel. Surprisingly light applications of these materials will remove the slipperiness and make smoothing with a plane or road grader effective. We have converted many, many miles of heavy clay roads, previously practically impassable during every wet spell, into boulevards for a large fraction of the year with the surface application, usually at separated periods, of a few inches of sand. The amount of sand required will vary almost directly with the stickiness of the clay and the amount of sand it will absorb without getting mealy. Experiment only can determine this in each case but, as a usual thing, to get a maintainable surface will require several applications, amounting to from 4 to 6 in. of loose sand. These applications are placed on the well graded and well compacted surface and are not mixed with the underlying clay at the time of application. Nature and constant smoothing will do the rest. The clay will finally come up from below sufficiently to properly bind the sand.

I have sketched, very briefly indeed, the general treatment of earth roads of the various classes in order to make them maintainable. None of these suggested improvements will make a good earth road unless immedately supplemented by an intense system of patrol maintenance. I have reached the conclusion that outside of the benefits derived from grading hills and getting proper widths and proper drainage, it is almost a waste of money to grade earth roads unless their surfaces are afterwards modified to make them maintainable and they are then patrol maintained.

Maintenance is the key to the whole earth road situation. Without patrol maintenance good earth roads are not possible, no matter what care is taken in their construction. Good drainage structures, good ditches, adequate cross-sections, and even good tile drainage will fail totally to provide a good earth road surface unless that surface is naturally maintainable or is modified so that it can be maintained —and then is maintained.

Our system of patrol maintenance of 7,500 mi. of state trunk highways in Wisconsin, and our county systems of patrol maintenance of an additional 5,000 mi., have been a revelation, not only to the people of the state, but also to the State Highway Commission and the county highway commissioners. In a short period of two years we have been able to effect a wonderful improvement in the general condition of our earth roads. In fact, the improvement made at small cost by using the above methods is almost unbelievable even to those who helped to produce it.

The roads which are being maintained are the most important roads in the state. Upon them the traffic is heavy. The Wisconsin cost of patrol maintenance is large, the present cost being about $175 per mile per year. The gang maintenance, including the regrading, widening and the more extensive applications of surface modifying materials, totals an additional $125 per mile per year, on the average. This gang maintenance is practically construction work done on a comparatively small mileage of road at bad sections, but its total cost divided by the total mileage maintained gives the above average of $125 per mile. The patrol maintenance of roads of lesser importance would cost less per mile, because the traffic would not cut them so deeply and so great widths would not have to be maintained, and thus the patrolmen's sections would be well extended. Our team patrol sections on earth roads vary from 6 to 9 mi. in length, according to the character of the road and the intensity of traffic. The average length is about 7 mi.

It must be remembered, however, that while earth roads constructed and maintained in general accordance with the standards given above will give good service during the period between the date when frost is fully out of the ground and the roads have dried and settled, and the time of heavy snows, they are not at all adequate for heavy traffic in prolonged wet seasons or in the spring.

No care in construction or in maintenance will make the ugly duckling into a swan. Given all possible care in their preparation for maintenance, and then given the best possible maintenance, in the final analysis earth roads are just earth roads, and, especially on clay soils, can never be made to stand the heavy concentrated traffic of main highways during the spring break-up or during prolonged wet spells. On less important roads, where traffic is light to moderately heavy, they will serve quite adequately all purposes during practically all seasons, if they are well maintained.

In regard to the proper grading and draining frequently mentioned above as being necessary before an earth road can be properly maintained, it is, of course, ideal if this grading can be done to the final profile and cross-sections and if the culverts and bridges can be built of the final type so that, no matter what changes may later occur in the surfacing upon the road, the roadbed proper and its drainage structures will be adequate. However, it is not often that this can be done over the whole mileage which should be instantly maintained. Each year all of this kind of permanent grading work should be done that it is possible to finance and to build, taking the worst stretches first and doing well what is done on the proper locations and to the final grades.

Pending the time that this final grading work can be completed for the whole mileage, it is not necessary to throw up one's hands and say that nothing can be done with the stretches not fit for maintenance and for the grading of which no adequate funds are available. Wonders can be performed on even the worst stretches of road by intelligently reshaping them with a heavy blade grader drawn by a good stout tractor. Temporary drainage structures can be used where necessary. Where no dirt is available from the sides some slushing or wheeling may be necessary to raise and widen certain of the fills.

We call this kind of work gang maintenance in Wisconsin and do hundreds of miles of it annually at a cost of from $150 to $500 a mile and at an average of probably $250 a mile under present conditions of wages, etc.

This work does not give the final roadbed, but it does give a maintainable roadbed, which can be kept safe and passable and which will serve quite adequately until funds are available for the final grading necessary before the permanent surfacing is applied.

Cutting and filling done to the nearest tenth of a foot is not a prerequisite to the maintenance of a good earth road. Fair widths, good shapes, and good drainage are necessary. These can be secured very cheaply and rapidly by the use of the methods broadly outlined above. There is required only good judgment, a few good men, a good heavy road machine and a reliable tractor with adequate power.

One other point should be distinctly accentuated and that is that the traveled way of well constructed earth roads, when patrol maintained, should be given a very slight crown. Excessive crowns are not necessary if earth roads are kept smooth. In general, the less the crown, the better the result will be. We believe that during the summer season a crown of not to exceed ⅓ in. to the foot is ample for any earth road, and that as it approaches its going into winter quarters the crown should be increased to not to exceed .6 in. to the foot. The time when heavy crowning was considered to be the acme of earth road perfection, is past. The portion of these roads which is to be traveled should be almost flat, but must always be kept smooth.

Based on our Wisconsin experience and our highway experience of nearly seventeen years, we believe we are safe in stating the following conclusions in regard to earth roads:

1. Earth roads will, for all time, comprise the largest fraction of our road mileage; therefore, their intelligent construction and maintenance is of paramount importance.

2. They should be given a proper cross-section, adjusted to the soil of which they are made and to the drainage conditions prevailing, as rapidly as

funds can be made available for the work. Gang maintenance grading methods should be used where funds are not available for the final grading.

3. They should be well drained by providing them with proper ditches, waterway structures of adequate size, and blind stone or tile drainage where necessary.

4. The most adequate attention should be first given to the real road terrors—those sections upon which traffic is constantly being stuck. These sections constitute an astonishingly small percentage of the total mileage of earth roads and cause an astoundingly large percentage of the traffic troubles on earth roads.

5. The grading and draining of earth roads is of little value unless it is immediately supplemented by an intensive system of patrol maintenance.

6. The surfaces of many earth roads should be modified by applications of the proper material if they are to be properly maintainable and are to give efficient service.

7. These modifiers are for sand roads, clay or clay gravels; and for clay roads, sand or sandy gravels.

8. Given proper drainage and the proper modification of the top surface, earth roads will give good satisfaction during the summer traffic season on roads carrying almost an indefinite amount of traffic.

9. They will, however, if on clay, fail to give service on very heavily traveled roads and practically on all other roads during the spring break-up and during prolonged wet seasons when their surfaces cannot be given effective smoothing.

10. The maintenance of earth roads should take the form of patrol maintenance, a man and team or a man and a motor truck being given a specific section of road for the condition of which section he is made solely responsible.

11. The best tools for the maintenance of earth road surfaces are: (1) the light two-horse blade grader and (2) the Minnesota or the Wisconsin planer. Split log and other forms of drags should be used seldom, because they go down into every transverse depression and up on every transverse ridge and accentuate these defects instead of removing them. Planers with long longitudinal bearings and road graders with long wheel bases remove these humps and depressions and can be operated practically as cheaply as the much less effective road drags.

12. Very moderate crowns should be used on the traveled way of all earth roads. Practically flat surfaces can be patrol maintained. They should be maintained flat until the road has to be made ready to go into winter quarters, when the crown should be increased.

13. Most of the modifications for earth road surfaces to make them more maintainable and more passable are slow processes. Additions of material are best made a little at a time and then worked, mixed and kept smooth, additional material being added as necessary until a maintainable surface is finally secured.

14. Skill, patience, and a large amount of religion are needed to cope successfully with earth roads. Given these requisites, wonders can be performed with them.

15. It is a poor highway official or a poor highway system which leaves earth roads to care for themselves while all time, all attention, and all money are expended upon the construction of a few miles of surfaced highway.

16. We are firmly convinced that, in practically any unit of government, given the alternative of expending all of the highway funds available in regrading and draining earth roads and in the modification and maintenance of their surfaces, or of expending all of the fund available in the construction of a few miles of surfaced roads, the people of the unit of government will receive much more benefit if the money is expended in the regrading, draining, modifying and maintaining.

17. This does not mean that I believe that construction should be neglected. It must be pushed as fast as it can be financed, but the speed of construction can well be retarded, if necessary, to provide for the proper maintenance of all important roads.

18. It is not conducive either to religion or to economic transportation to pass traffic over several miles of adequately surfaced highway, and then stall it in a sea of mud or swirl of sand a few feet from the end of the improvement.

19. The text of this discourse is "Maintain Your Earth Roads," building adequately surfaced roads as fast as you can afford to build them. For those roads which are not good and which you cannot afford to make good, at least do your level best. Give them a proper cross-section, proper drainage and a proper surface, and then give them the proper chance to do effective work by keeping that surface smooth and that drainage open.

20. Any one can take $50,000 and with it build a mile or so of beautiful road, but it takes brains and care to take the $50,000 and give a community 170 mi. of travelable earth surfaces, good the first year and growing better each year the $50,000 is furnished.

21. Can the word "cannot" and live the "I will" life when building and maintaining earth roads. Carry on with them and they will carry on for you.

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At Wheeling, W. Va., 68 Truck Owners were Recently Arrested in One Day, charged with violating the city ordinance relative to truck overloading. Most of these trucks were engaged in carrying coal. A Wheeling ordinance restricts the speed of heavy trucks to 8 mi. per hour and load to 600 lb. per inch of total tire width.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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HIGHWAY TRANSPORTATION DEVELOPMENT IN ENGLAND

Hauling over the highways had become a factor in transportation in England some time before it reached a similar stage of development in this country. In some ways the English still lead.

An idea of the present status of motor haulage in that country may be obtained by reference to the short article on "Highway Transportation in England," printed elsewhere in this issue. According to a statement attributed to the "London Times," highway transportation there is progressing rapidly and the present charges for highway hauling compare favorably with railroad freight rates.

It is also interesting to note the comparative costs of steam and gasoline power. In this country the steam engine has not been applied extensively in highway hauling, nor have we utilized trailers to the extent that the English have. It is certain that the trailer eventually will be used here more than it has been used in the past. The electric vehicle has a well recognized place in this country's highway transportation system and its use is likely to increase rather than decrease. It may be that there are also possibilities in the steam-driven motor vehicle that could be developed to advantage. Great as has been recent progress in highway haulage, it seems likely that really we are only at its beginning.

ROAD CONTRACTORS AND INCREASED FREIGHT RATES

Every road building season closes with many road contracts uncompleted. This year the number that will have to be carried over to next season will probably be greater than usual.

Most of the jobs that were commenced this year and will have to be carried over to the season of 1921 have been delayed through no fault of the contractors. It has been difficult to buy materials; shipments have been delayed beyond reason; labor has been scarce, high priced and inefficient.

Now freight rates have been greatly increased and contractors who have been unable to get shipments of materials face the probability of heavy losses in the completion of their contracts.

It is useless to protest the increases granted to the railroads. But the situation is a striking example of the hardships often imposed upon contractors by the ordinary contract. There is great need for reform in the making of these instruments, and the first and most earnest efforts should be directed towards making them fair to both parties.

A FEW WORTH-WHILE OBSERVATIONS ON ORDINARY ROADS

There are probably few road users who will not subscribe to the statement that: "It is not conducive either to religion or to economic transportation to pass traffic over several miles of adequately surfaced highway, and then stall it in a sea of mud or swirl of sand a few feet from the end of the improvement."

This is one of the conclusions reached by State Highway Engineer Hirst of Wisconsin, "based on our Wisconsin experience and our highway experience of nearly seventeen years." With twenty others, it appears in a paper, entitled "How to Improve and Maintain Earth, Clay and Sand Roads," which is printed elsewhere in this issue.

While all of the twenty-one conclusions reached by Mr. Hirst are worthy of emphasis, lack of space renders impracticable their repetition here. Several of them, however, are so closely related to the one already quoted—and so very apt—that they are set forth below for the consideration of those who have to do with the building and upkeep of the roads.

"It is a poor highway official or a poor highway system which leaves earth roads to care for themselves while all time, all attention, and all money are expended upon the construction of a few miles of surfaced highway.

"We are firmly convinced that, in practically any unit of government, given the alternative of expending all of the hghway funds available in regrading and draining earth roads and in the modification and maintenance of their surfaces, or of expending all of the fund available in the construction of a few miles of surfaced roads, the people of the unit of government will receive much more benefit if the money is expended in regrading, draining, modifying and maintaining.

"This does not mean that I believe that construction should be neglected. It must be pushed as fast as it can be financed, but the speed of construction can well be retarded, if necessary, to provide for the proper maintenance of all important roads."

Granting the truth of the observation in the first paragraph, a little thought will show how much truth there is in the three that follow it.

On What Are We Building Our Highways?

By H. G. SHIRLEY[*]

Much money is being expended annually in investigating and testing road surfacing materials. The Federal Government, many states, companies interested in the different materials, and private institutions have established large laboratories for such purpose. Yet we seldom find a laboratory making a study of the foundation soils.

Lately the Bureau of Public Roads has taken up this investigation in a small way, appreciating its great value. But the appropriation allotted the bureau for such an investigation is so small that it will not permit extensive research.

Each spring many sections of our roads go to pieces, due to the action on the foundation of moisture, frost, seepage, capillary attraction, etc. It is useless to expect the road crust to carry unsupported all the load; a firm foundation for our highways is just as essential as it is for every other structure. The little study that has been made of the foundation has been devoted to the draining of wet places where the subbase is constantly saturated by seepage water. Such places have been studied and in many cases remedied, but there has been very little, if any, study given to the bearing power of the different types of soils as a foundation, especially at the periods of the year when saturated with moisture.

It is safe to say that we know less about the subfoundation and its ability to sustain the pavement under the moving load than about any other feature of road construction. No constructive effort has been made until recently to find out just what action takes place or the ability of certain types of soils to withstand the impact and weight of a heavy, moving load.

To the writer's mind is recalled the biblical phrase. "What doth it profit a man if he gain the whole world and lose his own soul?" For what will it profit us to develop the very highest type of surfacing if we lose it all by a weak and unknown foundation. The question of a stable, firm, and unyielding foundation must have our best thought. The physical and chemical properties of the subsoils are so complicated that to properly solve this problem will require the very highest type of scientific investigation. Problems of materials, water, frost action, physical effects of heat, cold and moisture must be solved. It is, therefore, most important that such investigations should be made and a solution found quickly, so that roads can be constructed in the future to carry the maximum traffic over their entire length without injury.

This applies to the railroads and electric railways just as it does to the highways, and all should join in a cooperative way in the search for a solution. Congress should be requested to make a sufficient appropriation to the Bureau of Public Roads to establish a large research department so that such investigations can be speedily made and a practical solution found. By all working together a solution will soon be found and much money saved annually.

Advertising On Highway Signs In Maryland Is Ruled Illegal

Attorney General Armstrong of Maryland has ruled that the placing of advertising upon highway signals and signs in that state is forbidden by statute. Mr. Armstrong, in his opinion, which was given to the State Roads Commission on Aug. 12, stated that "when the Legislature directed the State Roads Commission to erect suitable guide posts, it intended that the work should be done at the expense of the state, and that when it forbade the attachment of advertising matter to objects along the state highways it meant the prohibition to be absolute."

The State Roads Commission was about to enter upon a contract with a firm manufacturing highway signals, the firm to erect and maintain the signals without expense to the state, retaining the right to sell advertising space on the signs. An opinion on the matter was asked from the Attorney General.

Governor Ritchie was in favor of the plan of securing the free signals, it is reported. Chairman Mackall of the State Roads Commission has announced that he will ask the next Legislature to empower him to decide the matter.

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Adair County, Missouri, will spend about $60,000 on road work this year. About $20,000 will be expended on the road between Novinger and Danforth and the remainder will be spent on through roads in the county.

Jackson County, Indiana, is unable to proceed with road work because of inability to secure bids on proposed improvements. Eighteen petitions for highway construction are now pending before the county commissioners and while some of them have been advertised several times, no bids have been received. This situation results, it is reported from unsettled labor conditions and the uncertainty of transportation facilities.

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[*] Secretary, Highway Industries Association.

New Freight Rates Will Greatly Increase Highway Construction Costs

The freight rate increases authorized recently by the Interstate Commerce Commission will amount to 40% in eastern territory, 35% in western territory and 25% in southern territory. These new rates were effective on Sept. 1. Since in many cases road building materials have freight as the largest factor in their costs, the new rates will have a very marked effect upon costs in the road building industry.

Costly Bridge to be Built Over Mississippi at New Orleans

The Commission Council of New Orleans, La., has authorized the purchase of 600 acres of land about 10 mi. above Canal Street to serve as terminals for the bridge to be erected across the Mississippi River at this point. The bridge, which, it is estimated, will cost $10,000,000, will permit the city to develop to the west.

The Public Belt Railway has commenced preparation of plans and specifications, which will be submitted to the War Department for approval when completed. The special committee of the Public Belt Railway says in its report that, the bridge "will be an important link in the highways of the state, which are now being generally extended, and will thus permit easy access for all motor vehicles and pedestrians."

Sale of California State Highway Bonds Upheld By Court

Discretionary Right of State Highway Commission to Use Federal Aid Funds Sustained in Suit by Former Secretary

The use of federal aid funds to increase the interest rate on state highway bonds of California so as to render the bonds salable, has been held legal and valid by Justice E. C. Hart. This opinion was given in the suit of W. R. Ellis, former secretary of the California State Highway Commission, who sought to compel the deposit of $329,011 federal aid funds to the credit of the state highway fund instead of to the credit of the surplus fund of the state treasury to be used in the sale of state highway bonds. Accordingly, the dicretionary right of the State Highway Commission in the use of federal funds is upheld. An opposite decision of the court would have caused California to curtail highway work because of inability to market bonds, unless a higher rate of interest is voted at the fall election.

The opinion of Justice Hart was concurred in by Associate Justice A. G. Burnett, with Superior Judge J. A. Plummer, who acted as presiding justice, dissenting. The opinion states that the sale of bonds must be measured by market conditions and that the provision of law requiring the sale of bonds at par was intended only to safeguard the state from selling bonds at a net loss to the state.

The case will be appealed to the Supreme Court, it is announced.

May Convert Railroad Bridge Over Hudson River Into Highway Bridge

The railroad bridge over the Hudson River at Poughkeepsie, N. Y., is inadequate to the increased and heavier traffic passing over it and the Central New England Railway Company, it is reported, has concluded that a new structure must be erected within a few years. This bridge is the only structure spanning the Hudson River for a distance of 150 mi., and would be of great value to traffic crossing the river.

Officials of the Poughkeepsie Chamber of Commerce are greatly interested in a movement to convert the structure into a highway bridge and are planning to bring the matter to the attention of the State Highway Department, with the request that the bridge be purchased and made a part of the state highway system.

Bridge Reconstruction In Indianapolis

Assistant City Engineer Protests Against Construction of Bridge in New Location And Recommends Strengthening of Existing Structures That Are Dangerous to Traffic

Nine highway bridges in the city of Indianapolis, Ind., have been declared unsafe for traffic by J. C. Elliott, Assistant City Engineer. The bridges are as follows:

Kentucky Ave., over White River; Holton Place, over the canal; Olive St., over Pleasant Run; Churchman Ave., over Pleasant Run; Raymond St., over Pleasant Run; Jefferson St., over Pogue's Run; 11th St., over the canal; St. Clair St., over the canal; and Udell St., over the canal. The Olive St. Bridge over Pleasant Run has been closed to traffic.

None of these bridges is safe for heavy loads, says Mr. Elliott. They are in such condition that they can not be rendered safe for present traffic needs without being rebuilt. On one structure he has recommended that a sign be placed advising truck drivers that a 3-ton load is the maximum safe load.

Mr. Elliott gave this information to the Board of Public Works of Indianapolis in protest against the proposed construction of a bridge over the canal at 21st St., involving the expenditure of about $150,000.

"The financial condition of the city would not permit the expenditure of this amount for a bridge at this location," said Mr. Elliott, "in view of the fact that we have not less than eight or ten bridges in other locations in the city already in service which are in a dangerous condition and should be rebuilt."

Higher Freight Rates On Road Materials Opposed In New York State

At a hearing of the New York Public Service Commission held in Albany, N. Y., on Aug. 17, relative to the proposed increase in freight rates, protests were entered by road builders and representatives of the New York State Highway Commission. The railroads had applied to the Public Service Commission for permission to file revised tariffs so that the rates could become effective on August 26. The new rates as applying to road building materials were opposed by road contractors and officials.

Daniel Willard, President of the Baltimore and Ohio Railroad, was also present at this hearing and is alleged to have argued that higher freight rates would reduce the cost of living. A person attending the hearing is reported to have afterwards said "If we only raised freight rates high enough we could build our roads for nothing and every citizen in the country could be given a permanent free meal ticket."

Maryland Rejects All Bids On $1,500,000 Road Bond Issue

Highest Bid of 93.185 Would Mean a Discount of $102,225 to the State

All bids for the State of Maryland's $1,500,000 road bond issue were rejected on Aug. 10 at the meeting of the Board of Public Works in Annapolis, at which time it was determined to wait until more favorable conditions exist for the selling of the bonds.

The highest bid received was from Alexander Brown & Sons, which was 93.185 and would have yielded $1,397,775. The next highest bidder was Estabrook & Co., who bid 93.17. Other bids were at 92.5677 and 92.279.

In a statement issued by Governor Ritchie, the reasons for the rejection of the bids were outlined as follows: The bids, while fair, were at too large a discount; the placing on the market of these bonds at large discount would lower the market price of existing and future state, county and city bonds in Maryland; there is no immediate necessity requiring the marketing of the bonds; the state will have $1,000,000 in its sinking fund in September, which can be used for the purchase of these bonds at par; the rejection of these bids will not retard road building.

Illinois Builds Roads in Spite of Unfavorable Conditions

Last year the state of Illinois awarded contracts for 570 mi. of federal aid roads, but because of the transportation situation only 170 mi. were completed, leaving 400 mi. carried over to the present season. Contracts for 50 additional miles to fill gaps in the system were awarded this year, making a total of 450 mi. of road to be constructed during 1920.

About the middle of last month it was announced that 100 mi. had been completed this season. Of the 100 road contractors' outfits with roads to build, the largest number at work at any one time has been 53, and when the coal strike was in progress the number of gangs at work dropped to 35. Coal shortage, added to inadequate transportation facilities, stopped road builders' machinery, cut down the production of cement and delayed gravel and stone production. However, Chief Highway Engineer Clifford C. Older, states that no other state, with the exception of Pennsylvania, approached this mileage of paved roads actually completed this year.

Car Priorities Hamper Road Work In Pennsylvania

Out of Road Program for Construction of 1,000 Mi. Only 110 Mi. Are Completed

Pennsylvania has 267 contracts for highway construction now in force, involving about 1,000 mi. of roads, according to a recent statement by State Highway Commissioner Lewis S. Sadler. Of this amount about 110 mi. have been completed. Restriction of open top cars in favor of the coal interests and embargoes upon certain materials essential in highway construction have seriously hampered Pennsylvania's road building program and may jeapordize it for the remainder of the year.

"Many of these contractors," says Commissioner Sadler, "have stocks of certain materials on hand that will result in serious loss to them if compelled to carry over another season. This situation unfortunately places highway construction in jeopardy and it would seem timely that proper consideration might be given to the importance of highway work and its effect upon industry and the economic life of the state. The roads are the first factor in the handling of the products of our industries, even before they are placed at railroad points for shipment

"The need for road development was never more apparent and when public sentiment and interest is as strong as has been evidenced the last 18 months, at the same time that such substantial provisions have been made for this class of work, it seems that curtailment at this time would be a step backward in our progress to develop a comprehensive system of durable highways so vital to our people."

ooo

The American Association of Engineers has now a membership of over 20,000. It was organized in 1915 and in 1918 had a membership of about 2,000. During 1919 about 8,000 members were secured. The present offices of the association occupy the entire sixth floor of 63 East Adams St., Chicago, Ill., and district offices are maintained in New York, Washington, Pittsburgh, San Francisco and El Paso. Since the beginning of 1919 the number of local chapters and clubs has increased from 26 to 209.

HIGHWAY TRANSPORTATION

Million More Motor Vehicles Add to Highway Problems

Growing Traffic Demands that Greater Attention be Given to Road Maintenance

That the present interest in the construction of new highways should not divert attention from properly maintaining highways already improved, particularly in view of the enormous increase in motor traffic which is taking place, is a point which the U. S. Bureau of Public Roads has emphasized many times in recent months. The bureau recently compiled statistics showing that there was a total of 7,562,446 registered motor cars in the United States in 1919. This is an increase of 23%, or 1,418,829 motor cars, over 1918. Such figures indicate that the country's highways are being used far more than in the past and that, consequently, greater attention must be given to the repair problem.

Additional use of roads and streets has, of course, been accompanied by additional revenue paid to state and local governments in the form of license fees, which in nearly all states are devoted to highway needs. The registration and license fees for motor vehicles in 1919 totaled $64,697,255, an increase of 20% over 1918. The total revenues for New York and Pennsylvania in the past year were about double thee revenues received for all motor vehicle registrations and licenses in the entire United States in 1912.

Motor Truckmen of New York City Form Association

Organization Will Coordinate Activities of Motor Truckmen in District—Return Loads Bureau Has Already Opened Office

At a recent meeting of motor truckmen of New York City at the Pennsylvania Hotel, a ship-by-truck association was formed with the purpose of coordinating the activities of the industry in New York and vicinity. Seventy-five prominent truckmen engaged in local and long distance motor trucking were present at the meeting and it is planned to hold a series of weekly meetings to perfect the plans of the association.

A return loads bureau for the benefit of shippers and truckmen was organized and protective measures against pilfering, which has greatly disturbed the motor trucking industry in the East, were adopted. The return loads bureau will act as a clearing house for local as well as long distance hauling and has already estabished headquarters at No. 1133 Broadway, New York City.

Harry J. Seidenburg, of the Pennsylvania Transportation Co., was elected temporary chairman: John H. Sand, of the Royal Efficiency Trucking Co., was elected treasurer, and H. T. Stockley, formerly Traffic Manager of the General Cigar Co., was appointed secretary.

The advisory council of the association is as follows: F. W. Fenn, General Manager of the National Automobile Chamber of Commerce; Wm. B. Doron, Director of the Firestone Ship-by-Truck Bureau, and Theodore T. Cones, President of "Commercial Trucking World."

Highway Transportation in England

English Engineer Advocates Use of Steam Wagons to Keep Down Operating Costs for Heavy Haulage After Extensive Study of Costs Per Ton-Mile of Steam and Petrol

The development of highway transportation in England is progressing rapidly, acording to the "London Times Trade Supplement," and it is pointed out that even under present conditions highway transport charges in that country compare favorably with railroad freight charges.

J. L. Clewes, who has compiled statistics in connection with a number of 4-ton lorries, presented many instances in which highway freight charges were less than railroad freight charges between large cities. While the petrol lorry is very extensively used in that country, there is great leaning toward the steam operated vehicle for highway transport.

T. W. Robson, speaking before the Institute ot Mechanical Engineers at a recent meeting in Lincoln, Lincolnshire, Eng., claimed that the steam wagon can be operated more cheaply for certain classes of work, although admitting that for maximum mobility with lighter loads and intermittent work the petrol vehicle has undisputed claims, while for short hauling the electric vehicle has a considerable field of application. Mr. Robson has collected cost data on the subject, covering a number of years.

This investigation embraces 15,000,000 ton-miles and it was found that the average cost by steam to carry 5 tons 1 mi. is 1s, 5½d, and by petrol, 2s, 10½d, showing an annual saving by each steam wagon which has an annual capacity of 75,000 ton-miles a year, or over £1,000 per annum. Even allowing for the subsequent increase in the price of coal, the annual saving is only reduced by £50. This investigation covered the performance of 100 steam vehicles and 10 petrol vehicles and costs stated include repairs, interest, depreciation, etc. Another advantage claimed for the steam wagon is that it regularly carries its full load and often hauls a trailer. With the rising cost of petrol, it was pointed out, the operating costs of the petrol vehicle will greatly increase, perhaps as high as 10d per mile for a 3-ton lorry, whereas a 3-ton steam wagon using hard furnace coke at £2 per ton, could be operated with 6 lb. of fuel per mile, making a cost of 1½d per mile.

EQUIPMENT—TRADE—MATERIALS

Investigation of Contraction and Expansion of Cement Mortar

An attempt has been made by the U. S. Bureau of Standards to effect a combination using a local mix that would not show unfavorable volumetric changes when cast in a dry absorptive form. Such a combination seems to have been obtained by using one part of this local mix with six parts of gravel screenings. The difference between this and other combinations is that the present one results in a harsh mix rather than a salvy or sticky one, since 1:1 or 1:2 mortars, which are salvy, are inclined to show unfavorable volumetric changes. Results suggest that a harsh, initially inadhesive mix is more likely to be susceptible to influences for reducing volumetric change than any other type of mixture.

Eleven Year Old Pavement on Steep Grade in Pawtucket, Rhode Island

Hand-Mixed Asphaltic Concrete Pavement on a 14½% Grade in Good Condition After 11 Years of Service Under City Traffic

An interesting example of the durability of well built pavements is furnished by the asphaltic concrete pavement on Rhodes St., between Pleasant St. and East Ave., in the City of Pawtucket, R. I. This section of paving is of especial interest because it is on a grade of over 14.5%—14.634, to be exact.

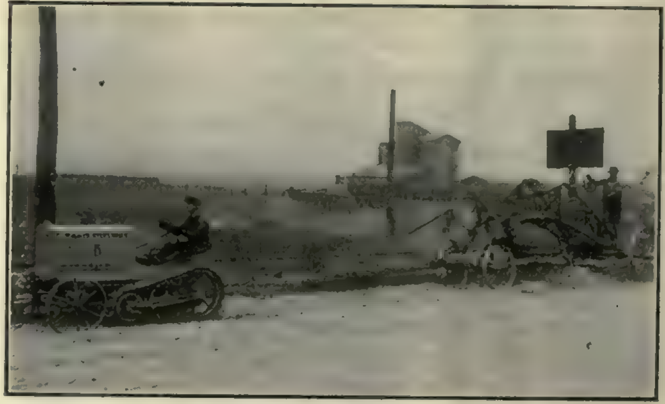
The pavement is of the cold mixed type, and was laid by the Board of Public Works of the city in 1909. The old road was reshaped with clean crushed stone and then covered with a surfacing of asphaltic concrete, hand mixed with hot shovels. The wearing course consisted of local crushed stone ranging from ½ to 1½ in. in size mixed with Texaco Macadam Binder in the proportion of 20 gal. of binder per cubic yard of stone. The mixture was laid to a depth of 2 in. and thoroughly compressed. After rolling, a seal coat of .6 gal. of binder per square yard was applied with brooms and squeegees and covered with clean stone chips.

RHODES STREET, PAWTUCKET, R. I.—TEXACO ASPHALT MACADAM LAID IN 1909

The pavement has been subjected to varying climate and traffic conditions during the past eleven years and at present is in excellent condition. According to Commissioner of Public Works Gill, no maintenance has been required.

The Bates "Steel Mule"

Tractors are fast becoming an important part of the equipment of road builders, because these machines possess many distinct advantages over mules and horses. Particularly in road grading tractors have been pressed into service and have been found both speedy and economical.



BATES "STEEL MULE" ON GRADING JOB

The accompanying illustration shows the Bates "Steel Mule" cutting 6 in. deep in grading a road in Will County, Illinois. This tractor is equipped with crawler traction which enables it to secure footing under severe conditions, while at the same time the front wheels of the machine permit easy steering. The machine shown in the picture is traveling on a 3% grade with the dynamometer registering a 3,000 lb. pull.

The Bates "Steel Mule" is manufactured by the Bates Machine and Tractor Co., Joliet, Ill.

Electric Arc Fusion Weld is Essentially a Casting

It has been discovered from investigations carried on by the U. S. Bureau of Standards that fusion welds differ from all other types, in that the metal of the weld is essentially a casting. No refinement of this metal is possible in the method as ordinarily carried out. A study of the process made by the Bureau consisted in the determination of the characteristic properties of arc fused metal. Such a knowledge is fundamental in any proper study of arc welding. This work has shown that skill, care and patience of the operator are matters of vital importance in successful arc welding. The data obtained in this investigation are now being put into shape for publication by the Bureau.

MEETINGS

Calendar of Coming Meetings

Sept. 1-3.—Michigan State Good Roads Association.—Annual Meeting, Lansing, Mich. President, P. T. Colgrove, Hastings, Mich.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Michigan State Good Roads Association

The annual meeting of the Michigan State Good Roads Association will be held at Lansing, Mich., on Sept. 1-3. It is expected that Governor Cox, Democratic nominee for president, will be present on Friday, Sept. 3, and that Montaville Flowers, representing the Republican party, will speak on Sept. 2. The Michigan State Highway Department is giving its customary cooperation to this meeting.

The program is as follows:

WEDNESDAY, SEPT. 1

Morning Session

Hon. P. T. Colgrove, Chairman

Opening of Exhibits.
Registration of Delegates and Commissioners.
Music, Community Singing.
Invocation, Rev. Edwin W. Bishop.
Addresses of Welcome:
  Representing State of Michigan, Governor Albert E. Sleeper.
  Representing Lansing Chamber of Commerce, Clarence E. Bement, President.
Response: P. T. Colgrove, President, Michigan State Good Roads Association, Annual Address.
Address: "How Better Roads Help the Farmer's Wife," by Mrs. Dora Stockman, Lansing.
Address: "Keep the Tracks Clear," by James Kehoe, Traverse City.
Address: "National Highways and their Importance to Michigan," by W. S. Linton, Saginaw.
Report of Field Secretary: Willard M. Bryant.
Report of Treasurer: Edward J. Roe.
Report of Secretary: A. A. Anderson.
Appointment of Committees.

Afternoon Session

IN CHARGE OF MICHIGAN STATE HIGHWAY DEPARTMENT

Frank F. Rogers, Presiding

Roll Call of Commissioners.
"Road Maintenance," by G. C. Dillman, Maintenance Engineer, State Highway Department.
  Discussion, led by Martin DeGlopper, District Engineer, State Highway Department.
"Beautification of Roadsides," by C. F. Beehler, District Engineer, State Highway Department.
Reports on Maintenance by County Commissioners and Engineers.

Evening Session

Prof. Arthur H. Blanchard, Presiding.

"Progress of Road Building in Michigan," (Illustrated) by Frank F. Rogers, State Highway Commissioner.
  Discussion, led by Leslie H. Belknap Chief Engineer, State Highway Department.

THURSDAY, SEPTEMBER 2

Morning Session

L. H. Neilsen, Presiding

"Paved Highways for Present-Day Traffic," by H. G. Shirley, Secretary Federal Highway Council, Washington, D. C.
Discussion, led by Arthur H. Blanchard, Professor of Highway Engineering and Highway Transport, University of Michigan.
"Observations," by James T. Voshell, Federal District Engineer, Chicago, Illinois.

Afternoon Session

IN CHARGGE MICHIGAN STATE GOOD ROADS ASSOCIATION

Hon. Philip T. Colgrove, Presiding.

Community Singing.
"The Townsend Bill," by Senator Chas. E. Townsend, Jackson, Mich.
"The Federal Highway Situation," by Roy D. Chapin, Detroit, Mich.
"The Monroe Roads," by Chas. E. Greening, Monroe, Mich.
"Economics of Highway Transport," by R. C. Hargreaves, Detroit, Mich.
"The Canadian Pike Tour," by Capt. W. S. Gilbreath, Detroit, Mich.

Evening Session

Hon. Philip T. Colgrove, Presiding.

Community Singing.
Montaville Flowers, of California, Representing the Republican Party and its Policy on National Highways and Federal Aid.
Reports of Committees.
Election of Officers.

FRIDAY, SEPTEMBER 3

EXHIBITORS' DAY

Morning Session

Hon. Philip T. Colgrove, Presiding.

Community Singing.
"Ship by Truck," by A. R. Kroh, Akron, Ohio.

Roll Call of Exhibitors.

International Good Roads Tour, July 14th to 29th, Moving Pictures.

Afternoon Session

Hon. Philip T. Colgrove, Presiding.

Community Singing.

Governor James M. Cox, Democratic Nominee for President, Dayton, Ohio, representing the Democratic Party and its Policy on National Highways and Federal Aid.

Engineers of Southern California Discuss Highway Problems

At a recent conference of highway engineers of Southern California, held under the auspicies of the Automobile Club of Southern California, it was voted to study types of pavements and future demands of traffic and to hold conferences for the discussion of highway matters. The county engineers of all but a few of the counties in Southern California were present at this conference and an invitation has been extended to the State Highway Department to appoint a delegate to attend future conferences.

The Inland Highway Association held a picnic on Aug. 18 at Manning, Ore. The membership of this organization is composed of citizens of Forest Grove, Banks, Manning, Buxton, Scofield and Veronica, who advocate the building of a state highway from Portland to Astoria, Ore., via these towns. Governor Olcott of Oregon, Senator Chamberlain and State Highway Commissioner Benson were scheduled to speak.

PERSONAL MENTION

A. B. Eaton has resigned as city engineer of El Dorado, Kan.

Arthur H. Blanchard, Professor of Highway Engineering and Highway Transport at the University of Michigan, was recently appointed consulting engineer to the Michigan State Highway Department.

A. N. Johnson, Engineer of the Portland Cement Association will leave that organization on Oct. 1 to take up his new duties as Dean of the Engineering School and Director of Engineering Research at the University of Maryland, College Park, Md.

Shell Roads

(Concluded from page 104)

carrying a traffic of 500 or 600 vehicles per day, provided there is not too much heavy truck traffic, but it is absolutely essential that there be a compact, heavy base. No surface treatment is any better than the base that carries it, and most of the failures can be traced to movements and settlements, even though these settlements are imperceptible from casual examinations of the surface. With the loads that the present day roads are expected to carry, it is absolutely necessary to increase the thickness of the shell so as to spread the load on the subgrade. No definite thickness can be specified, as it should be controlled by the character of the soil. Where thicker bases are used it would be well to put the shell down in at least two layers, letting the traffic compact the first layer before the second one is put on. Shell shrinks from 20% to 25% when put on the road, so that to get a 12-in. thickness would require 15 in. of loose material. This depth can not be fully compacted in one layer.

The cost of maintenance of untreated shell roads, carrying about 600 vehicles per day, was last year $2,000 per mile. With increasing costs, this price will be at least $2,500 per mile this year.

Surface treatment at present prices costs 40 ct. per square yard or $3,300 per mile for a 14-ft. roadway. Repairs for four years should cost no more than $500 per mile per year. This, with an intermediate retreatment at $2,700 per mile, will make the four years' cost of the road $8,000, or $2,000 per mile per year. The surface treated road should carry a traffic of 1,000 vehicles per day without increasing the above cost. Therefore, it would appear economy to surface treat shell when the maintenance cost exceeds $2,000 per mile, not only because it is a good investment but on account of the better maintained surface and relief from the dust nuisance.

The Maine State Highway Commission has recently awarded a contract for the construction of a machine shop and automobile service works in Augusta, to cost about $250,000, including equipment.

Motor Vehicles in Great Britain now number 750,000, according to the director general of the Roads Department of the Ministry of Transport. About 40,000 motor vehicles from the Western Front have been absorbed by English industry.

The State of Washington will submit a $30,000,000 road bond issue to the voters of the state for ratification at the fall election. Motor vehicle fees will be used to pay the interest on and the retirement of the bonds, if voted.

Chestnut Street, Philadelphia, Pa., will be widened on the northeast side of 15th St., according to the provisions of an ordinance recently signed by Mayor Moore. Two buildings on the northeast corner of Chestnut and 15th Sts. project several feet over the new building line and it is estimated that damages will amount to $35,000 in taking over the properties.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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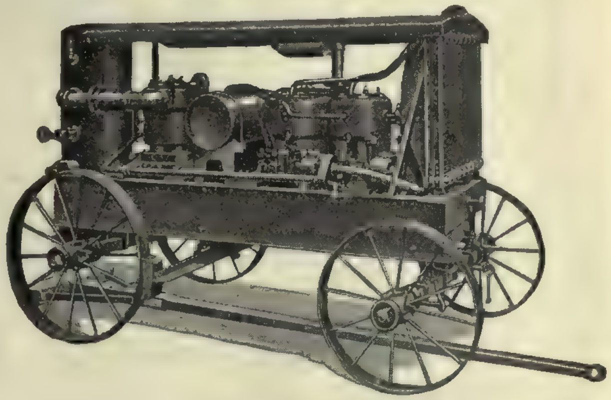

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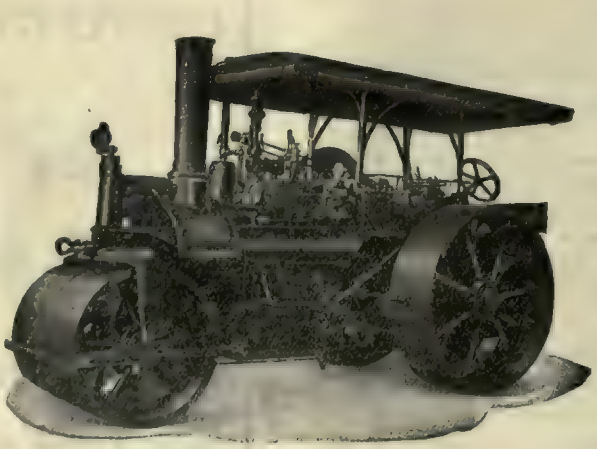

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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX

JAMESTOWN, N. Y., SEPTEMBER 8, 1920

Number
10

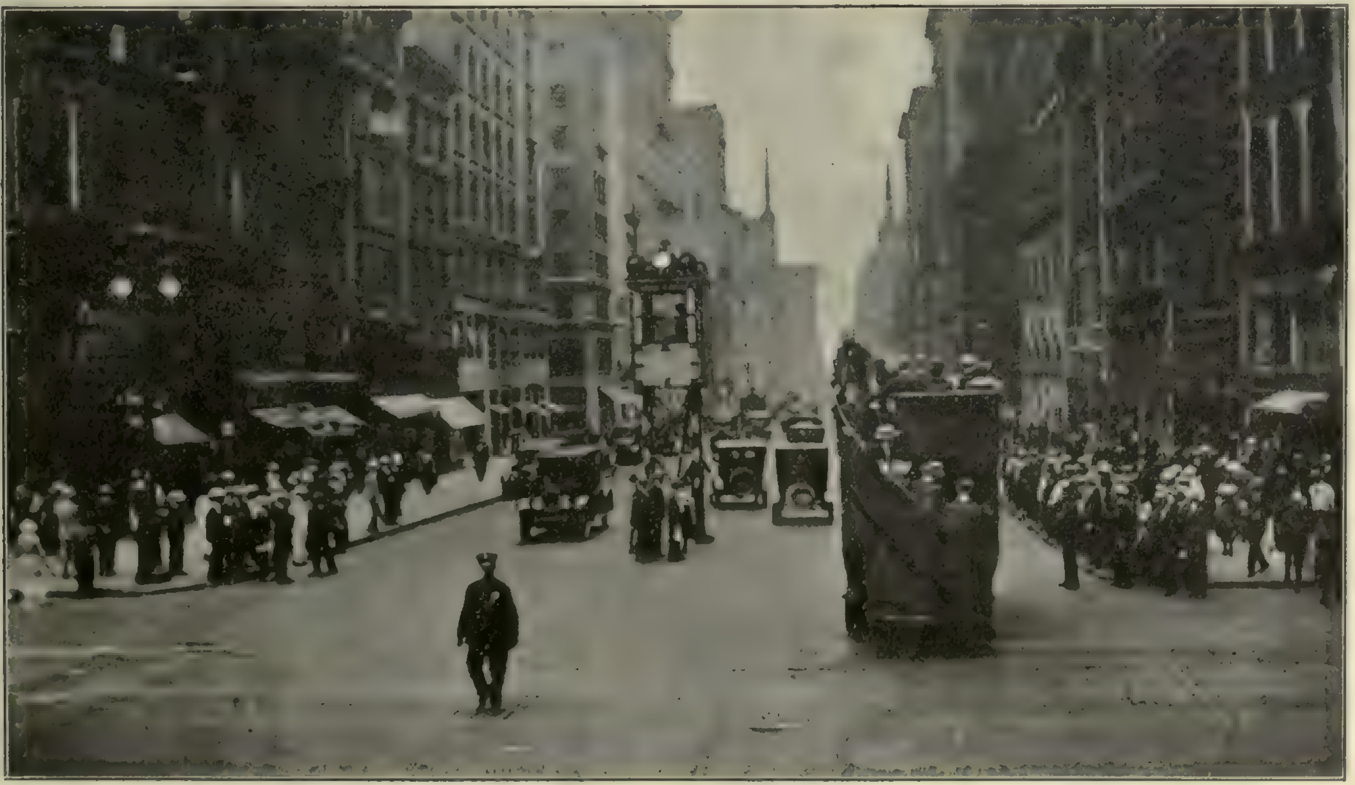
Traffic Control on Fifth Avenue, New York City

Vehicles in Zone of Greatest Congestion on N. Y. City's Chief Thoroughfare Regulated from Signal Towers Placed at Important Intersections—Conditions Greatly Improved Since Establishment

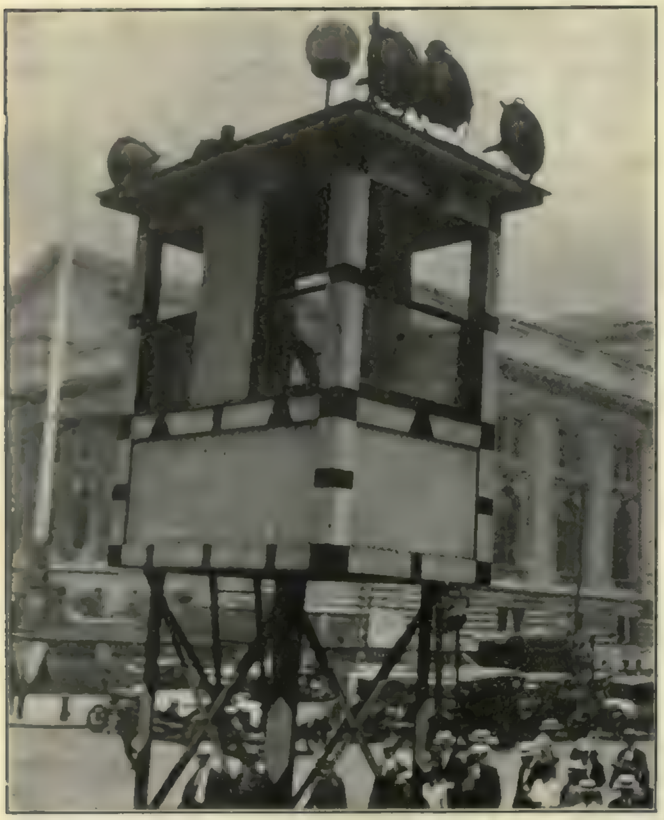
The famous Fifth Avenue of New York City is one of the most heavily traveled thoroughfares in the world, presenting an extremely difficult problem in traffic control. The facilities for through traffic in New York City are inadequate, because of the small number of north and south arteries to carry the traffic, and many plans have been proposed to remedy this situation,such as elevated highways, the cutting of avenues through existing blocks or the construction of a broad diagonal avenue from the Plaza to the Pennsylvania Station.

The zone of greatest congestion on Fifth Avenue extends for a distance of about 2 mi., between 23d and 60th Sts. It has been found that at certain times of the day a vehicle requires from 30 to 40 minutes to cover this distance. To remedy this condition, Special Deputy Police Commissioner John A. Harriss, in charge of traffic, has devised a system of traffic control which was placed in operation last spring and which has been found to greatly increase traffic mobility.

Five signal towers, similar to those shown in the



FIFTH AVENUE AT 34TH STREET, NEW YORK CITY—TRAFFIC SIGNAL TOWER AT CENTER OF AVENUE BEYOND CROSS STREET AND TRAFFIC OFFICER AT INTERSECTION accompanying illustrations, have been erected in the middle of the avenue at 34th, 38th, 42d, 50th and 57th Sts. These towers are similar to the signal towers in use on railroads, and are connected with each other by flash lights, push button signals and telephones, so that all the towers show the same signal at the same time; thus traffic moves and stops as one vehicle. The floors of the towers are 12 ft. above the roadway, affording a clear view for their occupants. In addition to their specific purpose, the towers also afford isles of safety for pedestrians crossing the avenue at these points. The towers have been painted white with blocks of black to make them stand out plainly.



TRAFFIC TOWER AT FIFTH AVENUE AND 42D ST., NEW YORK CITY

On the top of both the north and south sides of each tower, at a distance of 18 ft. above the roadway, are three powerful electric signal lights which are visible for a considerable distance under all weather conditions. These signals show red, yellow, and green lights, and are used for the control of traffic as follows:

When the yellow signal is displayed the traffic on the avenue moves and traffic from the cross streets is stopped. When the green signal is displayed the traffic on the avenue stops and cross street traffic proceeds. The red signal is flashed for a moment before a change of traffic signals, thus serving to warn vehicle drivers. The red signal is also used as an emergency signal and when displayed alone all traffic must come to a standstill.

These signals are in operation from 9 a. m. until midnight and serve not only to direct vehicular traffic, but alslo regulate the pedestrians crossing the street, who are required to move with the traffic, according to signal.

It was originally planned to make the parallell Fifth and Park Avenues one way streets from 10 a. m. to 5 p. m., southbound traffic moving on Fifth Avenue and northbound traffic moving on Park Avenue, but that plan was abandoned for the present system. That the present system of traffic control on Fifth Avenue is successful is evidenced in the fact that the time taken to travel this greatly congested section has been greatly reduced and that pedestrians move with greater facility and safety. The number of vehicles passing a given point in a given length of time under the present system is double that under the former method of traffic control.

New Jersey Allots $500,000 State Aid Funds to Counties

State Highway Commission Awards State Aid Funds and Resolves to Ask Increase In License Fees for Greater Revenues

The New Jersey State Highway Commission on Aug. 18 apportioned $426,000 of state aid funds to various counties for road construction during the present season. These allotments were made from an appropriation of $500,000 made by the legislature for state aid work and the balance will be awarded later. Atlantic, Bergen, Camden, Hudson, Hunterdon, Mercer and Warren Counties received $30,000 each. Ocean, Salem, Sussex and Union County received $25,000 each. Middlesex County was awarded $33,500; Morris County $24,000; Passaic County $26,000; Cumberland County $12,500, and Burlington County $20,000.

Urgent need for additional funds for maintenance of state highways prompted the commission to adopt a resolution asking for a conference with the Senate committee on highways. At this conference the commission will impress upon the committee that the funds now available are entirely inadequate. As a temporary expedient the Legislature will be asked to increase the revenues from motor vehicles by passing legislation providing for a license fee of $1 per horse power on each automobile. Such a law would materially increase the funds for highway maintenance.

Bankers and Highway Officials Confer On Oregon's Road Problems

A conference was held recently in the office of S. Benson, State Highway Commissioner of Oregon, to discuss the road problems now facing that state. It is understood that Oregon is badly hampered in its highway work because of the lack of available funds, such condition arising from the unfavorable bond market. Many prominent bankers and highway officials were present at the conference.

Cooperation Between Education and Industry from the Viewpoint of the Manufacturer*

By ROY D. CHAPIN†

Sound engineering education forms the firm foundation stone of American industry. For this reason I am more than appreciative of the opportunity to talk before your organization about further cooperation between the engineering educators and industrial heads.

Wherein can such cooperation be beneficial to you, your students, and to their future employers? In answering this question, first let us consider the purpose of an engineering education. Primarily it should train the mind to analyze and create; it should provide the student with a means of earning a good livelihood; it should broaden his contact with his fellow man; and as the years go on it should be a potent factor in contributing to the happiness of his existence.

Complaint has been made to me by engineers who have been out of college some years that their profession does not receive the recognition given to that of law or medicine. Their previous training requires an unusual amount of hard work and they have felt that the results obtained have not justified their intensive preparation. Analysis of this lack of recognition would seem to indicate that too many so-called engineers have undertaken their profession without any particular fitness for the work. Again, the actual quality of the work of an engineer can perhaps more easily be checked up than that of a lawyer or physician. In other words, his results are placed upon a dollars and cents basis and he is paid accordingly. The third fundamental reason would seem to be the lack of ability on the part of many engineers throughout their careers to make a genuinely practical application of their training. Too often they are not ready for executive work when the opportunity arrives. Business heads are also at fault in employing too cheap or inexperienced engineers for big jobs, then blaming the profession instead of themselves.

Industry's Relation to Engineering Education

Agriculture and industry are the two great businesses of this country. If the success of all industry is founded on sound engineering, then industry has more than a friendly interest in the type of men you turn out. There are so many conspicuous examples of failures of large and small businesses due to bad engineering that you should not have to prove to any executive the importance of his engineering department or the desirability of employing only technical men of the highest quality.

In preparing the material for my talk to you, I felt that one man's ideas could not adequately cover the subject. Therefore, I got into communication with a large number of leaders, particularly in my own industry, many of them executive heads, others engineering heads, but all men of wide experience and usually employers of many engineers. It so happens that the automotive industry is the largest in the United States producing a finished product. It employs engineers in very large numbers and its engineering methods can certainly be taken as representative. Therefore, the suggestions that I may make and the conclusions drawn are founded upon a composite of thought which I hope may be of value to you.

Education and Industry Insufficiently Coordinated

As we all know, there is a great lack of coordination in the present relation of technical schools to industry. Some industries have been wise enough to take advantage of this. They have kept in touch with many of your colleges and have made it easy for your students to find employment in their organizations. Frequently this has not been the best thing for the future of the graduate. The ease with which his first job was obtained has caused many a man to ally himself with a type of work without any particular future and for which he found too late he was not temperamentally fitted. Plenty of engineers who hold great promise are still tied down to low salaries even though ten or twenty years out of college. It seems highly important that graduates should start right, immediately they leave their alma mater. We all know the increase in responsibility the minute a man marries, and the tendency that he has to hold to the work he is doing rather than take a chance on a change which might permit him to go far ahead.

Does not this prove two facts? First, that an attempt sohuld be made to divert to other college courses men who demonstrate that they are not fitted to be successful engineers, directing them to those courses to which they seem best suited. Second, that you should give the student the training which will let him become a producer immediately upon graduation and along the line in which he knows positively that he is fitted to work.

Suggestions from Industrial Leaders

It is a general remark in industry that when the average technical school graduate takes his first job he is inclined to think he "knows it all." He desires too much salary for what he can return to his employer, and becomes impatient if advancement is not very rapid. Speaking from the standpoint of an employer, I have had occasion many times to explain to over-ambitious boys that the only reason for raising pay is because the employee earns more than he is getting, and that to advance, an employee must always be earning more than his pay check indicates. Some employers dislike to take men direct from school and would rather let some other factory give them their first training, with the idea that they can then hire them later. Usually men just out of college are paid from 20 to 50% more if they have had summer work along the lines of their specialty or have had previous shop experience.

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*Address at the 28th annual meeting of the Society for the Promotion of Engineering Education, Ann Arbor, Mich., June 29, 1920.

†President, Hudson Motor Car Co., and Chairman, Highways Committee, National Automobile Chamber of Commerce.

Why should all this be so?

The answer seems to be unanimous that lack of practical training in college necessitates such training after leaving college, thereby holding a graduate back until he has secured a happy combination of both theory and practice.

It is impossible to reproduce in your college laboratories or shops the actual conditions within industry. In general, the most successful engineers are those in whom there has been developed a commercial instinct which so guides their engineering work that the results pay out. We have had many graduates in our engineering department who, fresh from college, were entrusted with occasional attempts on design work. The results from the new men have been far from satisfactory. Their designs are usually commercially impractical, showing insufficient regard for cost of manufacture, length of time involved to bring through the design, availability of the new material specified, or the cost of scrapping the old materials. An additional handicap is that executives are disposed to prejudge the results, because they do not conceive the new man to have a sound idea of commercial engineering. Everyone knows that there is a tremendous field today in industry for those men who will assume responsibility and who are real executives. The engineer should think outside of his job, should have courage to take responsibility and go ahead. However, to do this he must have a solid foundation of well-rounded training, and it is the consensus of opinion that as yet you men are not furnishing that solid foundation for the average graduate. One well known and successful engineer has told me that the majority of engineering graduates seem to have acquired the information imparted to them, but only a few of them have actually learned to apply that information in practice. The president of a big company says:

"The engineer should have a sufficiently broad conception of the functions of the finance, sales, and production departments and the relationship between them and his own, so that he will have a sympathetic understanding of their problems and difficulties."

Another executive says:

"An engineering graduate in the factory is a liability for some time after his employment."

In talking with young engineers six or eight years out of college, they have regretted their lack of practical experience, felt their progress had been slowed up, and several of them were not optimistic over the future of strictly engineering work. They said that they had no business training and from an executive standpoint they were not confident enough of themselves. Perhaps the answer to this might be that they should have made it a point to secure this training since they left college. Again the human equation enters, and we deal with the tendency of most men to stick to what they call a steady job rather than take chances on what you might term an instructive job.

Present Opportunities for Practical Training

I have investigated to find what opportunities are presented today for undergraduates to secure practical experience along their line of study. Of course, the summer vacation period has offered the greatest chance. However, the work done is usually without any particular supervision and without an appreciation by the employer of what the boy is heading for. Properly supervised, I believe that credit can well be given for certain work done during summer vacations.

Every executive and engineer with whom I have talked and corresponded is very favorable to cooperative engineering courses between the college and industry. All of you are doubtless familiar with these courses at the University of Cincinnati, University of Pittsburgh, the new courses at Harvard, and the cooperation between the General Electric Co. and the Massachusetts Institute of Technology. The University of Detroit has placed a number of men in our factory and many other plants in the city, with very successful results. The men have taken a real interest in their work and the reports from our factory favor such cooperative plan as producing better engineers. Dr. Hollis Godfrey, President of Drexel Institute, has well recognized this need of cooperation, and, with Dr. Capen, is heading a large movement to bring about closer relations between colleges and the men who employ their graduates. Dr. Godfrey tells me that he is meeting with great success in his plan and it merits the heartiest of support.

Essentially you want to turn out men who will reflect the utmost credit upon your institution, upon your ability to teach, and upon the selection of courses that you have taught them. You want to produce engineers who can readily and commercially adapt themselves to the work they undertake. Let me cite an interesting case to you.

How One Famous Engineer Would Educate His Son

One of the more prominent engineers in the automotive industry is a graduate of a leading university

(Continued on page 122)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX SEPTEMBER 8, 1920 No. 10

PRACTICAL EXPERIENCE FOR STUDENTS IN HIGHWAY ENGINEERING

The need for cooperation between educational institutions and industries in the training of engineers is emphasized in a paper by R. D. Chapin, entitled "Cooperation Between Education and Industry from the Viewpoint of the Manufacturer," which is printed on other pages of this issue. Though it refers primarily to "shop practice" for the engineering student, under commercial conditions, the principle is particularly applicable to training for highway work.

In the first place, highway work is a branch of engineering in which there is a very real need for reinforcing class and drafting room work with experience on actual work, or at least opportunities for observing it in progress. Unlike many other kinds of construction it can not—at least, is not often—illustrated, even on a much reduced scale, in the shops or laboratories of technical schools. Moreover, many of the processes involved are less readily visualized than are some of those incident to other kinds of construction.

In the second place, road work, even more than other common kinds of engineering, is a seasonal occupation and its season is at its height during vacation weeks. In addition, there are many places in it for workers without special skill, but with intelligence and a desire to be useful. It thus offers the student excellent opportunities for the kind of summer work that will be of the most benefit to him.

If, as is so frequently claimed, there is a real lack of properly trained highway engineers, engineering schools and state highway departments should be able to do much to remedy that condition by cooperation in providing practical training for students of highway engineering.

"STATE ROADS"

Surely there can exist little doubt that the progress made in road betterment is due in very large measure to the adoption of the state aid principle and its application in the work done by the states during the better part of the past thirty years. Indeed, so firmly fixed is some such idea in the minds of most people that an improved road is frequently referred to as a "state road," although in one state where that practice is especially common, along many of the best roads there are substantial concrete posts carrying the number of the road and designating it as a county highway.

Without in the least detracting from the credit due the various state highway departments, it is desired to call attention to the fact that much of the road improvement that is carried out is done by counties and townships wholly or partly with their own funds. In more than a few states the volume of this kind of work greatly exceeds that done by the state alone.

This is one of the points on which the general public should be better informed.

PUBLIC KNOWLEDGE OF ROAD BUILDING

Every little while somebody proposes a "campaign of education" for the purpose of forcing upon the general public a knowledge of road building. Though no particular instance has been noted lately, attempts of the sort are common enough to merit attention.

Road building is an art calling for scientific knowledge, technical training and actual experience. It is just as much a specialty requiring special skill as is law or medicine. We have always argued that the public should know something about road work, but we believe that such knowledge should be of just the same extent as the public's knowledge of the treatment of disease or the conduct of litigation—just enough to insure the entrusting of the actual work to those whose business it is.

In urging the popularization of road building knowledge it is often argued that the layman needs such knowledge because the road is a public utility in which he has a peculiarly close interest. This may be so, but is his interest in the road greater than in many other utliities such, for instance, as the telephone, the electric light, the water supply of his town or its sewerage system? All of these are things that the average layman uses almost, if not quite, as much as he uses the highways. Yet he is in no need of a knowledge of the technic of telephony, of the generation of electricity, of the purification of water or of the disposal of sewage. If the methods of laying pavements and of preparing the materials used in them are matters of which the layman needs detailed knowledge, is it not equally essential that he should possess quite as detailed information on the construction of reservoirs, pumping stations and filter beds, the laying of water mains and the chemical and physical processes involved in the purification of water? If he ought to know all about grading and draining roads and the construction of highway bridges, ought he not to have also a thorough knowledge of the design of a sewerage system and the treatment of sewage?

There can be no possible objection to a layman's interesting himself in road work to any degree he sees fit; in fact, he will be a better citizen for having such knowledge. But the amount of knowledge he needs to have, as has been indicated, is merely enough to realize that he should leave the building of roads to road builders and that he should insist upon honesty and business ability on the part of highway officials.

Cooperation Between Education and Industry from the Viewpoint of the Manufacturer

(Continued from page 120)

in Europe. During his college course he spent his vacations in various shops acquiring the practical knowledge of the theory which he was studying. When anyone spoke to him about foundry practice he knew what it meant. He had actual experience with steam engines, gasoline engines, operation of machinery. All of this he learned under working shop conditions. When he graduated he planned to go to England to start work. His father advised him to come to this country because of the greater opportunities. Today his success is acknowledged and he has many engineers under him. He told me that he ascribed part of his success to the fact that coming as a stranger to this country it became necessary for him to study American shop methods and adapt his educaion to them. This was so emphasized in his mind that today he feels that he knows the practical side of his work far better than most Americans. From his experience with American engineering graduates, he emphatically insists that our colleges should insist upon practical experience that will make our engineers commercial as well as technical. I asked him how he would train his own son whom he hopes will become an engineer. He said that after the boy graduates from high school he is going to put him in a foundry for two months, then in a general machine shop for six months, where he will become familiar with a great variety of work, then for four months he will put him in a large plant where progressive manufacturing is conducted on a big scale. As all quantity production in America is now adopting somewhat similar methods, he reasoned that this last experience would be useful for almost any type of manufacturing in which the boy might eventually be involved. He felt that this year of shop experience would quickly demonstrate to his own satisfaction and that of the boy whether engineering work would appeal to him and whether he had a natural fitness for it. He would then put his boy in college with the feeling that he had removed most of the abstract from his college work. The boy would be able mentally to apply most of what he learned in his previous year's experience in actual shop practice. This engineer thought that three years should cover the time his boy would be in school, having given one year to his previous practical training. He would want his boy to spend a certain part of his summer vacations in the shops and perhaps his classes might take various excursions through industrial establishments and receive an insight into the practical methods employed. This is the way that one brainy man would solve the problem of his son's technical education.

Application of Practical Methods

Every investigation points to the desirability of practical training. If we are agreed that this is so, how can the colleges best adapt their engineering curricula to meet the needs of the situation? Building up an actual working arrangement with various industries is a slow process for any college. Some of you have such cooperation now well under way. Others are contemplating it. To those who have not effected such cooperation the time is surely here to make a survey of all industrial possibilities in your section and to interest the industrial leaders in your plan. These leaders are almost always desirous of of helping develop education, and are willing to do their share. Those who are slow will be brought into line by the example of others. It is not necessary for me to suggest the type of cooperative arrangement to be worked out, as some of your institutions already have ample experience available to you. Investigation seems to indicate that those colleges with cooperative courses are exceedingly popular with the students and particularly with the type of student who realizes that his college training is just as much his business in life as his life work will be after graduating.

Faculties Might Well Try it Also

If this practical up-to-date training in American industry is of value to the student, is it not equally of value to you who instruct the students? Should not you too go out from your college atmosphere and spend a certain amount of time every two years, not in consulting work but in actual practical work along the line of your specialty? You would bring new thoughts to the shop, field or laboratory where you spent this time, and would take back to college with you a more intimate knowledge of just why some of your students make quick progress and others never seem to reach the goal for which their training should fit them. It might prove inconvenient to you, but your classes would surely reflect creditably your outside contact.

Other Complementary Courses

In addition to the practical training, it seems a general opinion that every engineer should be made to take a certain number of courses in business administration, thus furnishing a groundwork for later executive opportunities and a truer aspect as to what is commercial engineering. Everyone with whom I have talked thought this of primary importance. You can confer a favor too upon literary students by offering those students who are going into industry an opportunity, by virtue of short courses in the engineering department, to learn how to read a blue print and at the same time get some conception of what part engineering plays in all industry. My college experience was confined to literary work with optional courses in law. Actually a better conception of engineering on my part would have made my first years out of college much easier in an industry where engineering plays such an important part. However, a knowledge of the laws pertaining to patents and contracts is valuable to all business men and particularly to the engineering profession.

Highway and Automotive Engineering Openings

Automotive engineering is now so ramified and calls for so many men that I am sure your institutions will do well to keenly study its future. Outside of mechanical, chemical, electrical and metallurgical engineering are now the newer great developments coming in highway, traffic, transport, and safety engineering. Incidentally, automotive engineers should always have some training in highway engineering that they may appreciate the relation between their product and the roadbed it traverses. Enormous appropriations are being made for highway construction in this country and at a conference in Washington this spring, called by Dr. Claxton of the Bureau of Education, it was quite apparent that the demand for highway engineers as well as highway transport engineers is already far in excess of the facilities of the colleges of the country to turn them out. I am sure that the automotive industry will gladly cooperate in any of your plans looking to specialization in automotive subjects.

Two Ideas Regarding Research Work

One other point that seems to be of interest to the men with whom I have talked: They feel that great results can be accomplished in your research work and methods. Perhaps quotations from some of them will interest you. A well known engineer says:

"I am strongly in favor of a certain kind of research for seniors—a sort of easy research with practical application that will not present problems so hard as to discourage the man who is working on them, and yet difficult enough to give him a sense of accomplishment in overcoming the obstacles that arise and different enough from his ordinary work to catch his interest at a time when a good many men begin to go stale. Research work of a different type, more difficult, and perhaps more theoretical in nature is justified in postgraduate courses and as subjects for faculties to work on. Such work increases the prestige of the school, and extends the fund of basic knowledge on which all our practical commercial structures rest. At the same time, the men in charge of all the engineering courses should have enough practical experience to know what are the desirable factors to make prominent in the minds of their men in order to build up the habit of thought and a perspective that will increase the chance for each student becoming a real success."

One executive says:

"I believe that research conducted by the higher schools of learning is often lost to the commercial world because of the fact that the investigators do not have the commercial instinct, nor do they always realize the value of the various results which they obtain, when practically applied."

Another suggested that engineering colleges should have the opportunity of comparing their research results with those of the industrial laboratories, to the benefit of both. He thought that the Bureau of Standards or the National Research Council might well coordinate research reports from all technical colleges, thus preventing too much duplication and at the same time encourage efforts in needed directions.

In conclusion, it seems quite apparent that more practical training must be given as part of the engineering courses and that it is most desirable that the professors and instructors should actually know by personal experience what this practical training constitutes. America is entering a period of enormous industrial expansion and with her rapidly growing export trade our engineering methods are fast coming into competition with those of European engineers. It is your natural desire to lead the world, and this is best expressed in the quality of work turned out. This quality can be enhanced by giving the men, during their college courses, a more practical insight into the everyday problems they will encounter after graduation, even though it takes you some years to build up the practical contacts necessary. Thus you will secure for your graduates the respect and admiration of those who employ them and the same respect and admiration for your recognition of their problems.

Building An Illinois Highway

Unusually Rapid Progress Made by an Illinois Contractor by the Use of Labor Saving Machinery on a Cement Concrete Paving Job.

Road building machinery has been developed rapidly and to a high state of efficiency, especially the machinery used in the construction of cement concrete roads. In the state of Illinois, which has an elaborate program for the construction of highways of this type many contractors are laying in one day yardages of this material that it would have been impossible to lay in a much longer time a few years ago. If it were not that the freight situation seriously hampers the work, the rate of road construction would be several times as rapid as it is. Road builders and manufacturers of road building machinery have kept pace with the march of progress but are hampered seriously in carrying on their work by the decadent railroads.

In the paving work on a $1,500,000 contract near Paris, Ill., Alan Jay Parrish, an Illinois contractor, on August 6, 1920, laid 779 lin. ft. of concrete road, 16 ft. wide and 8 in. thick, using a Smith Simplex paving mixer. This run was made in 9½ hours and one full minute was allowed to mix each 4-bag batch. The average time for mixing and placing each batch was about 75 seconds, the complete cycle of the mixing operation running about 70 seconds. Considering the fact that a full minute of mixing was required, only about 10 seconds were consumed in the loading and placing operation—probably the record on a complete day's run.

The operations of the mixer have been so synchronized that the discharging time and the skip-raising time were perfectly balanced. When the operator pulled the discharge lever he would also engage the skip-raising lever. Thus when the drum was completely emptied, the loaded skip had been raised and started to reload the drum for the next mix. The aggregate was handled in 'turn-over' batch boxes and the movement of the derrick handling the boxes controlled by the movement of the skip, thus avoiding unnecessary delay. The derrick cable on this mixer works over a drum so that the skip and derrick hooks travel in reverse directions.

The materials used on this job, which is still under construction, are transported from the storage bins at Oliver, Ill., about 1 mi. distant from the job. The sand and stone are unloaded from the freight cars by a ½-yd. full revolving Erie crane which travels on a track parallel to the unloading siding. Storage bins and material piles are used in storing materials.

The industrial railway between the loading bins and the mixer was carefully installed and thoroughly drained before the track was laid. Mr. Parrish has found that carelessly graded railways cause derailments with expensive delays. So far, only two minor derailments have occurred on this job. Careful attention was paid to the placing of the railway sidings so that the mixer would be always supplied and never be idle.

The industrial cars, each carrying two batch boxes, receive the sand and stone at the loading bins. A grade from the loading bins permits the car to move by gravity to the cement loading platform, where the cement is added to each batch box. Ten cars and a Plymouth 3-ton locomotive form a train. There is no back-switching between the loading station and the mixer.

The latest models of Heltzel steel forms are used and the new Parrish tamping machine tamps and finishes the concrete, a 1:2:3½ mix.

Upon the completion of 1½ mi. of pavement, the paver was moved back to the starting point and worked in the opposite direction, reducing the length of haul. Because the paver is equipped with a derrick which can be used on either side, the industrial railway was kept on the same side of the road.

Thirty-two men are employed on the job, as follows: 2 crane men, 4 men at loading station, 4 train men, 8 men in grading crew, 2 men on batch boxes at mixer, 1 engineer, 1 fireman, 3 men spreading concrete, 1 tamping machine operator, 2 men edging and spading, 1 superintendent, 2 foremen, 1 water boy.

Mr. Parrish contemplates using a 5-bag mix and expects to lay 800 lin. ft. of roadway a day.

Indiana County Engineers May Not Include Bond Discounts In Estimates

The Indiana State Board of Tax Commissioners has announced that it will not approve any county bond issues for highway improvement when the engineer's estimate for the cost of the work includes items for discount on the bonds. S. N. Cragun, State Tax Commissioner, has announced that several county engineers have included such items in hope of overcoming the difficulties in marketing bonds.

The legal interest rate in Illinois for road bonds is 5%, the rate having been raised from 4½% by the special session of the Legislature. Bonds bearing this rate are not readily salable and many road projects have been held up because of the inability of county officials to dispose of the bonds. By including the discount of the bonds in the estimate of the engineer, the contractor could purchase the bonds at par and sell them at market value, being protected by the item in the engineer's estimate.

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The Commissioners of Carbon County, Pennsylvania, recently passed a resolution to increase the bonded indebtedness of the county to the amount of $200,000 for the building of highways. The bonds will bear 5½% interest and will be advertised in a short time.

Increased Freight Rates on Road Materials In New York Suspended Until October

Pleas of Road Builders More Successful With New York Public Service Commission Than With Interstate Commerce Commission

The Public Service Commission, Second District, New York, has suspended until Oct. 15, the operation of the increased freight rates in that state applying to sand, gravel, rock, crushed stone, slag and cement, in order to give the commission time to investigate and determine the reasonableness of the new rates.

This action results largely from the activities of the State Highway Commission and road builders who greatly opposed the increase in rates on materials necessary to road construction and maintenance. At a hearing before the Public Service Commission it was pointed out that the establishment of the 40% increase in freight rates would play havoc with road contractors now holding contracts and would greatly interfere with road development. The action of the Public Service Commission will require the railroads to justify the necessity for the 40% advance on this class of construction materials.

The higher freight and passenger rates granted by the Interstate Commerce Commission went into effect at midnight on Aug. 25, throughout the United States. It is estimated by competent officials that the new rates will cost the nation over $4,000,000 per day, which will be reflected in the prices of commodities. Road building will be particularly affected, since the cost of road materials is made up to a very large measure of transportation costs.

Maryland Selects System of Lateral Roads For Future Improvement

State Roads Commission Selects 85 Miles From Recommendations of Boards of County Commissioners for Lateral Highway System

The Maryland State Roads Commission has made its selection of approximately 85 mi. of roads to be included in its system of lateral highways These roads were recommended by the commissioners of the various counties and will form the basis of state highway development, to be constructed as the funds become available. The routes as selected by the Commission follow:

Allegany County: National Pike, towards Vale Summit, 2 mi.; Morantown to Allegany, Legislative Road, 1.6 mi.; Barrellville to Pennsylvania line, 1.6 mi.

Anne Arundel County: Mountain Road, 3.5 mi.

Baltimore County: Hereford Road, west from York Road, 2 mi.; Philadelphia Road, from city line to Golden Ring, 2.3 mi.; Falls Road, south from Ridge Church, 1 mi.; Park Heights Avenue, 1 mi.; North Point Road, 1 mi.

Carroll County: Manchester Road, 1 mi.; New Windsor Road, 3.5 mi.; Hanover Road, 1 mi.; Union Bridge Road, 1.5 mi.; Warfieldsburg Road, 2.5 mi.; Oakfield Mills Road, 1 mi.

Caroline County: Grove to Fowling Creek, 2.5 mi.; Long's Schoolhouse to Hillsboro, 1.5 mi.; Ridgeley to Bridgetown, 1 mi.; Goldsboro to Marydel to Delaware line, 1.5 mi.

Dorchester County: Eldorado-Federalsburg Road, 2 mi.; adjacent to Hurlock, 0.3 mi.

Garrett County: Friendsville to Kaese's Mill, 2 mi.; Oakland-Hutton Road, 2 mi.

Harford County: Philadelphia Road, 3 mi.; Black Horse to Jarrettsville, 2 mi.

Kent County: Still Pond Station to state road, 2.8 mi.; Galena-Millington Road, 3.2 mi.

Montgomery County: Beallsville to Dickerson, 0.4 mi.; Rockville to Huntington Hill, 3.2 mi.; Gaithersburg, Muncaster Hill, 2.8 mi.; Sligo-Colesville, 3 mi.

Queen Annes County: Ingleside-Millington, 2 mi.; Stevensville-Love Point, 2 mi.

St. Mary's County: Morganza to Colton, 5 mi.

Somerset County: End of state road to Pocomoke, 0.5 mi.

Talbot County: Easton-Claiborne, 3 mi.

Worcester County: DuPont Boulevard connection at Berlin, 3.6 mi.; Snow Hill-Stockton, 2 mi.; Pocomoke-Stockton, 2 mi.

Wicomico County: State road from Willards to Powellville, 2 mi.; Quantico to Royal Oak, 4 mi.

Indiana Engineers Removed From Office

H. K. Bishop, Chief Engineer of Construction of the Indiana State Highway Commission, Wallace Southard, Chief of the Bureau of Plans, and J. M. Kimmel, Chief of the Bureau of County Aid of the State Highway Commission, have been removed from office, effective Sept. 1, according to a recent report from Indianapolis.

C. Gray, who has been chief of the Bureau of Contracts, is acting as chief engineer and is also directing the work of the Bureau of County Aid. G. R. Harr, an assistant of Mr. Southard, is in charge of the Bureau of Plans.

No official statement has been issued concerning this action releasing these engineers, though their services are understood to have been entirely satisfactory. Mr. Bishop is recognized as one of the foremost highway engineers in the country.

Contractors Will Be Allowed No Delay in Work in New York State

At a recent hearing in Albany, N. Y., Frederick S. Greene, State Highway Commissioner, declared that road contractors will not be allowed to delay work on contracts until next season because of alleged shortage of labor and difficulty in securing material. 'Contractors must start work or their contracts will be cancelled and readvertised," Commissioner Greene stated to Joseph Belotte, who holds a contract for building a road near Troy, N. Y., and who asked for extension of time until next spring.

Maricopa County, Arizona, Will Vote on $4,500,000 Bond Issue

A road bond issue of $4,500,000 has been authorized by the Board of Supervisors of Maricopa County, Arizona, subject to the approval of the taxpayers of the county at a special election. This bond issue will provide funds to complete the county highway program of 280 mi. of paved roads. A petition signed by 15% of the electors of the county asked that an election be ordered by the supervisors to vote upon the proposed issue.

Maricopa County recently voted a bond issue for $4,000,000 for highway construction, but it was found that with the increased costs the entire program could not be carried out without additional funds. The county highway commission has been instructed to investigate and report on the public highways of the county with respect to the additional funds needed to carry out the program. The date of the special election will be announced after the county highway commission has filed its report.

Berks County, Pennsylvania, Sells $975,000 Bond Issue Over Counter in Four Days

The entire $975,000 road and bridge bonds recently authorized by Berks County, Pennsylvania, have been sold over the counter by the Berks County Trust Company in less than four days. The bonds bear 5% interest and the ease with which they were disposed will startle officials of many counties in which road work has been curtailed or suspended because of inability to market bonds.

The city of Readng, the county seat of Berks County, is selling $1,000,000 worth of 5% bridge, road and water bonds over the counter. Philadelphia individuals and bankers have taken large blocks of both issues and Pittsburgh interests have purchased many of the county bonds.

Americans Will Build Panama Highways

A road commission has been created by the Republic of Panama and J. W. Beardsley, of Rochester, N. Y., has been appointed engineer. Mr. Beardsley has had extensive experience in road building in the Phillipines and other tropical countries. Several large construction companies in the United States recently sent representatives to Panama to prepare estimates on the work contemplated in that country.

New York State Will Enforce the Law for Clearing Weeds and Brush from Highways

Notices have been sent to town superintendents in New York by Frederick S. Greene, State Highway Commissioner, directing their attention to Section 54 of the highway law, which requires that the owner or occupant of lands abutting upon a highway shall before September 1, cut or remove all weeds and brush growing within the bounds of the highway. A special drive will be made to give the roads a clean appearance.

"Town highway superintendents will make an inspection of the highways in their sections," Commissioner Greene said, "and where property owners do not comply with the law, they will order the work done of ridding the highways of weeds and brush and assess the cost against the property."

Bureau of Public Roads Conducts Survey of Highway Operations in California

A survey of the work and operations of the California State Highway Commission has been started by the U. S. Bureau of Public Roads at the request of A. B. Fletcher, State Highway Engineer. The work is being done under the direction of L. R. Hewes of the San Francisco district, who is assisted by J. Shirley Bright, District Engineer for the States of Colorado, Montana, Utah and Idaho.

Twenty men are engaged in the work of taking samples of highways and examining the accounts of the commission to ascertain costs of construction and other data. When the survey is completed a report will be issued by the U. S. Bureau of Public Roads.

ooo

A Bill Will Be Introduced in the Michigan Legislature which will empower the State Highway Department to construct paths along all main highways in that state.

Washington County, Maryland, will oil all its roads at an estimated cost of $75,000. Two motor trucks have been purchased by the county commissioners for use in road work.

Touring the State of Minnesota, Senator P. H. McGarry and Fred D. Sherman are sponsoring the passage of the Babcock good roads amendment. At St. Cloud, speeches were made in the Great Northern Railway shops and about 2,000 persons were in attendance.

The Nevada State Highway Department has been advised by the U. S. Bureau of Public Roads that the policy of requiring a 24 ft. minimum width of highways constructed in Neveda with federal aid has been rescinded. The minimum widths which will now be approved in Nevada are as follows: graded roadway, 18 ft.; surfacing, 10 ft. Under this ruling Nevada will be enabled to carry out a more comprehensive plan of highway development.

Citizens of Newark, Del., have asked the State Highway Department to take over the section of the Lincoln Highway between Wilmington and Newark and improve this section. This request was made at a public meeting which was attended by Josiah Marvel, a member of the State Highway Commission, and Charles M. Upham, Chief Engineer. The business men of Newark favored the passing of the highway, through Main Street of the town in preference to a proposed route a short distance south of Newark

EQUIPMENT—TRADE—MATERIALS

Bilger Steel Culvert Forms

The Highway Culvert Form Co., of Peoria, Ill., has purchased the business, patents and good will of the Highway Culvert Form Co., of Ottawa, Ill. The company manufactures collapsible steel forms of the one-man type for the building of arch and flat top concrete culverts and bridges. These forms may be set up without tools and can be collapsed and removed by any common laborer in less than half an hour.

The forms consist essentally of three parts, base angles, centers and cover plates. The base angles are 9 ft. long, made of steel 3/16 in. thick, and are standard and interchangeable for all sizes. The centers are made of 14-gauge steel plates, stiffened against buckling by horizontal flanges at top and bottom, also by heavy angles riveted vertically to the main plate. The cover plates are 9 ft. long and are made of 14-gauge hot-rolled blue annealed steel.

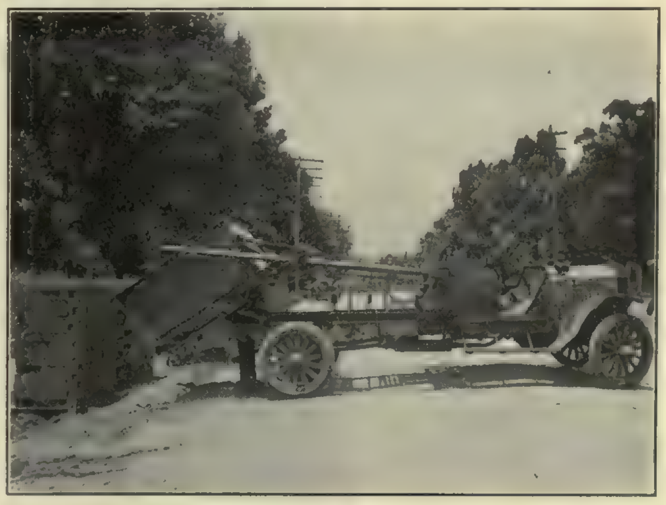
To collapse the forms the ends of the base angles are struck with a maul, thus bringing the beveled plates out from under the centers. All base angles that are butted end to end go along together, the centers remaining fixed against horizontal movement. The centers may or may not drop of their own weight off the beveled plates on the base angles. If they do, the cover plates can be drawn out before the centers, if desired. When the centers do not drop of their own weight, a bar is used upon the first two centers in the vertical space between the top of the center and the top plates, dropping the center to the base angles. Then the center while still upright can be swung around off the base angles and taken off, after which the cover plates can be taken out.

H. E. Bilger, inventor of the Bilger steel forms manufactured by the Highway Culvert Form Co., is general manager of the company and until 1919 was road engineer of the Illinois State Highway Department.

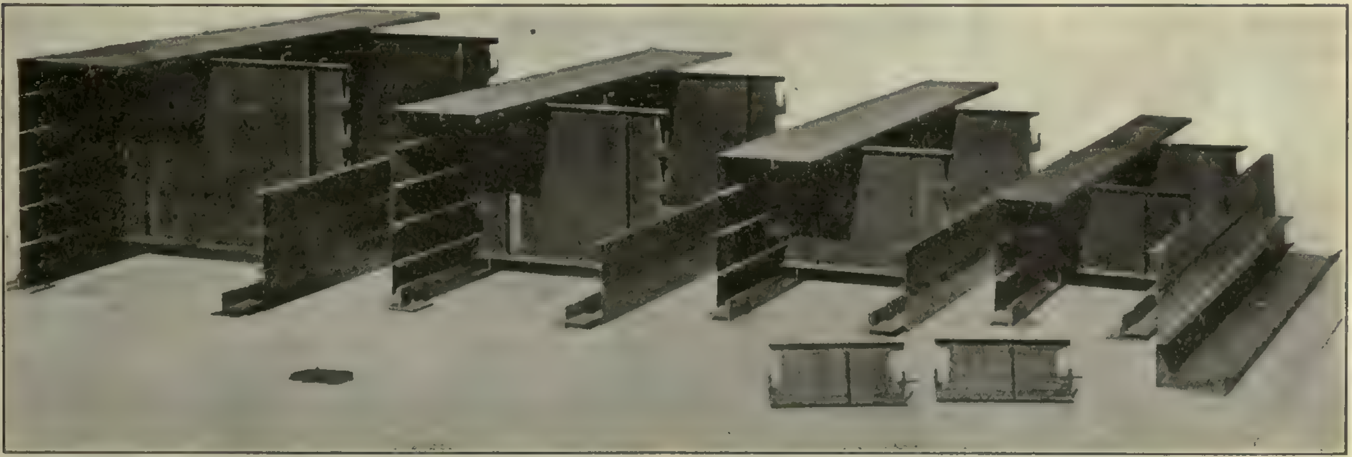
Truck Body For Handling Brick

A body for motor trucks which is designed to save considerable time and labor in the handling of paving and other brick, is manufactured by the American Truck Body Co., Martinsville, Va. Two or more bodies are used with each truck, one being filled while the truck is delivering a loaded body. The brick are set down in perfect stack and chipping and cracking are eliminated in the haulage.

The equipment consists of a frame, with power hoist, cradle and two detachable bodies with pallets. The frame is bolted to the chassis with U bolts and the cradle moves back and forth on the frame in such a manner that the body may be set upon the ground and then carried back on the truck in position for hauling. The body is pulled over the arc of a



FOUNTAINE BRICK-HANDLING BODY ON INDIANA TRUCK.



9 FT. SECTIONS OF BILGER FLAT TOP CULVERT FORMS PARTLY SET UP.

circle, thus making it easier to handle the load. The detachable bodies are held in place on the cradle by means of two lateral arms which hold securely a pipe on the body. The pallet acts as the tail gate and is left under the brick until used.

The accompanying illustration shows the detachable body being drawn upon the truck after having deposited a load of paving brick on the roadside.

Rogers Four-Wheel Drive Tractor

A new 4-wheel drive tractor, which, because of its flexibility, can be used under very severe conditions, has been placed upon the market by the Rogers Tractor and Trailer Co., Albion, Pa. Any one of the four wheels can be raised 5 ft. from the ground without throwing any gears out of alignment or causing any friction.

The power from the 98 h. p. motor is transmitted to the front and rear differentials by carbon steel shafts. From each differential the power is transmitted to bull pinions, being delivered to the wheels by external ring gears. In this way the power is delivered to the four drive wheels without the use of a single universal joint and it is claimed that maximum power is thus delivered.

ROGERS FOUR WHEEL DRIVE TRACTOR.

The machine weighs 15,000 lb., the wheels are 48 in. in diameter and all gears are built of high grade steel and run in oil. The Rogers tractor will turn in a radius of 16.5 ft.

Americans Will Promote Good Roads Campaign In Argentine Republic

Good Roads Association Now Being Formed in South American Republic Will Be Aided by American Makers of Road Machinery and Materials Who Export Products to Republic

A good roads association has been formed in Argentina and plans are being formulated for a nation-wide good roads educational campaign in that country. Interest in this movement was stimullated by S. T. Henry, Vice President of the Allied Machinery Co. of America, who, in a recent speech at a luncheon of the American Club of Buenos Aires, outlined the great work of the American Automobile Association and other organizations in promoting good roads in the United States. It was urged that all American concerns whose business in Argentina depends in any way on good roads get together in support of a good roads campaign.

An organization committee has been formed and a board of directors elected. A group of local business men has underwritten a temporary organization and J. N. Wisner, formerly manager of the United States Chamber of Commerce in the Argentine Republic, has been employed to manage the association during the organization period.

Managers and agents of the Argentina departments of American firms will appeal to their home offices for funds to aid the movement. It is planned to raise $150,000 for the work of the first year and several large subscriptions have been promised as soon as the personnel of the directors and manager are known. Most of these subscriptions were promised from managers of American interests who realize the great impetus which good roads will give their business. Several manufacturers of road materials and equipment have signified their intention to aid the movement.

PERSONAL MENTION

C. E. Ridley has resigned as city engineer of Port Arthur, Texas.

S. H. Bonar has been appointed city engineer of Moundsville, W. Va.

John W. Meredith has been appointed city engineer of Antioch, Cal.

R. E. Harwood, civil engineer and road contractor, died recently at his home in Springfield, Ohio.

A. E. Dyatt has been appointed resident engineer on federal aid work in Douglas County, Kansas.

R. P. Easler has resigned as city engineer of Antioch, Cal., and is now manager of the West Coast Dredging Co.

John H. Bringhurst has been appointed assistant engineer in the Bureau of Highways, Philadelphia, Pa. This position pays $2,310 per year.

J. R. McDermott has resigned as assistant highway engineer of Harrison County, Ohio, and is now assistant division engineer with the West Virginia State Roads Commission.

Fred C. Dunlap, Chief of the Bureau of Highways, Philadelphia, Pa., has been appointed acting chief of the Bureau of Street Cleaning. It is rumored that the two bureaus will be consolidated.

———ooo———

Hancock County, Ohio, failed to receive any bids on Aug. 3, on three issues of highway bonds totaling $85,000 and bearing 6% interest. An issue of $181,000 of 6% highway bonds has also been offered and no bids have been received.

GOOD ROADS

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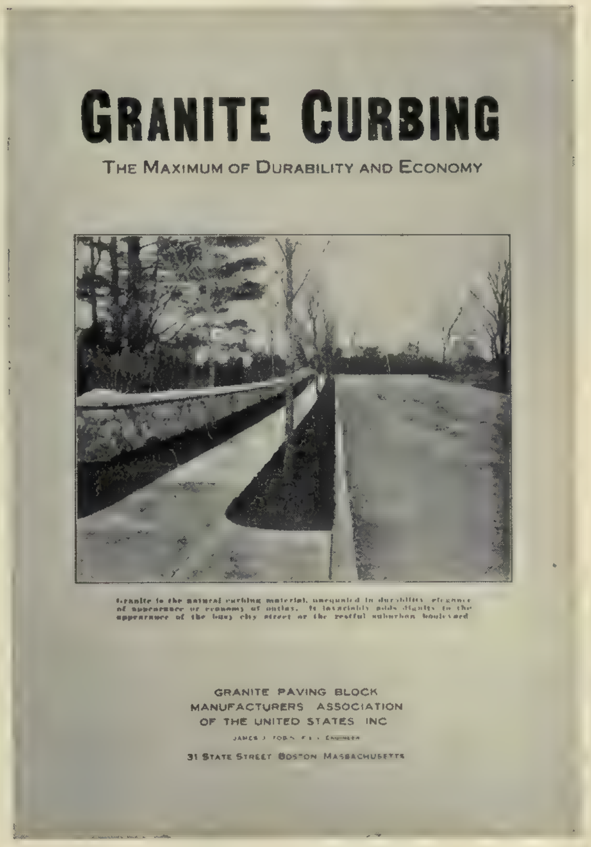

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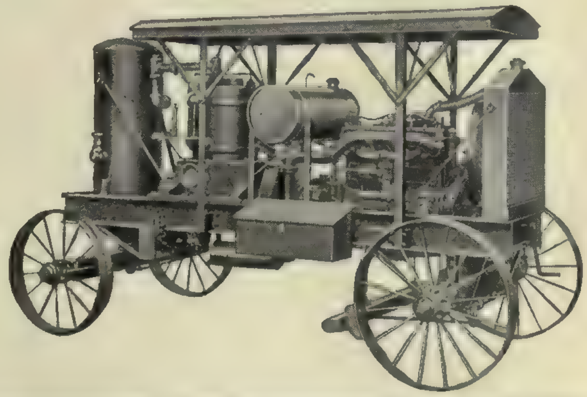

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Waterbound macadam road looking north from village of Saugatuck, Michigan, treated with "Tarvia-B" in 1917, 1918 and 1919.

West Michigan Pike, near village of Douglas, Mich. Waterbound macadam treated with "Tarvia-B" in 1917, 1918 and 1919.

In oval: Waterbound macadam road near South Haven, Mich., patched with "Tarvia-KP" and treated with "Tarvia-B" 1918, 1919.

West Michigan Pike, Van Buren County, Michigan. Waterbound macadam roadway treated with "Tarvia-B" in 1918 and 1919. Part of a 15 mile stretch of Tarviated roadway.

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ALL over the United States there are thousands of road commissioners facing the prospect of having to build new roads at the present high cost of construction.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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JAMESTOWN, N. Y., SEPTEMBER 15, 1920

Number 11

Scenic Roads in the Catskills

Highways in Catskill Park, including 40 Miles of Road Around Ashokan Reservoir, are Automobile Routes Through Region of Remarkable Scenery Easily Accessible from All Parts of State

The construction and maintenance of the Ashokan highways in New York State, built in the years 1913 and 1914, have been of particular interest to road builders. In the building of the Ashokan Reservoir, the largest reservoir in the world for potable water, about 40 mi. of new highways were constructed to take the place of roads included in the reservoir area. [See "Road Construction at the Ashokan Reservoir of the New York City Water Supply", Good Roads, Sept. 5, 1914, page 87, and "Asphaltic Pavements at Ashokan", Good Roads, Aug. 20, 1919]. But the Catskill Mountain region, of which the Ashokan watershed forms a part, in addition to containing engineering undertakings of unusual interest, contains also some of the most beautiful scenery in the East, is easily reached by many highways suitable for motor traffic. Thousands of motorists visit this region each year; thus do good roads open up the beauties of this wild and picturesque region. The following facts, taken largely from Recreation Circular No. 4 of the New York State Conservation Commission, outline briefly the routes which make accessible one of the most scenic regions of this country, the Catskill Mountains.

VIEW FROM ROAD IN ESOPUS VALLEY, SHOWING GLIMPSE OF SCENERY EASILY ACCESSIBLE TO MOTORISTS

Many highway routes lead into Catskill Park, the state reservation which includes the central part of the Catskill Mountain region. The area of the park is about 576,120 acres, of which the state owns 107,500 acres, lying in the Hudson, Delaware and Mohawk River watersheds. The valley of the Esopus, a tributary of the Hudson, lies in the heart of the region and drains approximately 50% of the area. The northern portion of the park lies in the watershed of Schoharie Creek which empties into the Mohawk River. The southern and western parts of the region are drained by tributaries of the Delaware River.

Entrance to the Catskill Park by highway from the northeast or east is best made by way of East Windham, Saugerties or Kingston; from the northwest by way of Oneonta; and from the south by way of Liberty or Roscoe. Improved highways run north and south along both sides of the Hudson River and are connected by ferry from Beacon to Newburgh, Poughkeepsie to Highland, Rhinecliffe to Rondout and Greendale to Catskill, thus making the region readily accessible from New York City on the south and Albany on the north.

The roads of Catskill Park may be roughly classifiedd according to the different sections. In the northern part where the valleys are wide and dotted with farms, the roads are in general in good condition. The valley of the Esopus, occupying the central section, is traversed by a state road for its entire length. In the southern and western parts of the park there are dirt roads. While they are passable for automobiles, they are not as good as the roads in the central and northern sections.

The eastern boundary of the park in Greene County is a cliff of rocks and ledges several hundred feet in height, surmounted by a plateau, from which some of the most wonderful and beautiful views in the entire Catskill region may be obtained from highways readily accessible by automobile. Many ravines cut the eastern wall of the plateau, furnishing scenery as wild and beautiful as can be found in the northern Rocky Mountains.

Starting from Catskill, a state road follows the Catskill Creek Valley to Cairo, climbing the mountain through Acra to South Durham. From this point a dirt road continues for 3 mi. up the mountain to East Windham, where on a clear day a marvelous panorama of scenery to the north greets the motorist. At this place there is a sheer drop of the mountain sides, giving the impression of gazing off into space East Windham is situated on the height of the Catskill plateau, an elevation of 1,900 ft. From East Windham a good earth road runs westerly along the Batavia Kill through Windham and Ashland to Prattsville, where it connects with the macadam state road, which in turn connects at Oneonta with the state highway between Albany and Binghamton. Motorists can enter the heart of the northern Catskills from either Windham or Prattsville by state highways leading to Hunter, Tannersville, Haines Falls, Kaaterskill and Elba Park.

The Esopus watershed may be entered from those roads lying in the Schoharie watershed either through Stony Clove or Westkill Notch. The grandeur of the Catskills reaches its height in Stony Clove. The rocky slopes of Hunter Mountain on the west and of Plateau Mountain on the east tower in striking manner above the pass, barely wide enough for the railroad and highway. The Westkill Notch is also possessed of great beauty, with the dense balsam forests covering the mountains to the east and Halcott Mountain on the west, rising sharply from the shady glen in the pass. A mountain stream and several small ponds add to the beauty of this spot.

From Kingston a road leads along the Esopus and around either side of the Ashokan Reservoir, which is divided into two parts by a causeway traversed by a macadam road. To the west of the dam which creates the lake are seen many of the highest peaks of the Catskills, rising beyond the west end of the lake in panoramic beauty. At the southern end of the range High Point looms up majestically to an elevation of over 3,000 ft. To the south are seen the rugged masses of Hanover, Cornell and Wittenberg Mountains, over which may be seen the top of Slide Mountain, the highest in the Catskills.

Following the state road along the Esopus Creek, Big Indian is soon reached, from whence a dirt road passes by the foot of Slide Mountain on to Clareyville, where a better road leads to Ellenville.

The southern sections of the Catskills are readily accessible from southwestern New York through Middletown or Newburgh, thus making all parts of this great realm of natural beauty easily reached by the motorist.

$100,000 Damage Done to Pavements of Toledo, Ohio, by Cloudburst

A cloudburst in Toledo, O., on Aug. 16, damaged about a mile of wood block pavement to the extent of over $100,000, besides damaging many buildings and the stocks in cellars of business houses. Because the sewers were unable to carry away the unprecented precipitation, the streets were flooded and the wood block pavements were torn up, floating away upon the water for several squares. Six city squares of pavement on Jefferson St. were torn up. This pavement had been down about six years. Sections on Monroe St., Bancroft St., and several other streets were torn up by the flood.

The blocks will for the most part be salvaged and repairs to the streets have been started.

The highest depth of water on the streets is reported to have been about 2 ft., and city highway officials can not assign any reason for the pavement to float away in some sections, while other sections under the same conditions remained fast.

The Canadian Pike Tour[*]

By CAPT. W. S. GILBREATH[†]

In 1912 President Wilson, then Governor of New Jersey addressed the American Road Congress at Atlantic City. His speech to my mind is one of the real classics of good road oratory, and I would have every one read it, whether they are interested in good roads or not. Three paragraphs of this speech contain the real basis of the inspiration for the institution and building up of the Michigan Pikes' Association and I trust you will pardon me for quoting them.

"A nation is bound together by its means of communication; its means of communication create its thought. Its means of intercommunications are the means of its sympathy; they are the means by which the various parts of it keep in touch with one another.

"The question of highways is a question which has interested my thoughts, particularly in recent years, because it is one of the few great instrumentalities of our public life and of our communal life with which the government is of necessity connected. It is intended to be an open artery free for any released energy to flow in, and so the highway is of necessity a public instrumentality.

"When I think of what the highways means, I feel to be thinking of the whole history of the human race. Whenever I used to read stories I remember my imagination was most fascinated when the characters went on a journey and met the rest of the world. On the old highways, particularly the old English highways, you met everybody, from the king to the beggar, from the king to the highwayman. You were there in a way to have the adventure, the whole experience and adventure of English life because it was there that English life interlaced and crossed and was fluid, flowing from one region to another, and by the same token it was upon the highways that men get to contacts which result in the building up of public opinions."

Some six years ago when Wm. E. Metzger, Edward N. Hines and other citizens of Detroit got together to organize an association, which would have for its primary object the building of a continuous connected improved highway along the eastern border of Michigan, they had in mind just the thing: "An open artery free for any released energy to flow in" and "In the building up of public opinion."

The first tour was a real hardship, but a success in that it started people thinking. The second and third tours showed much improvement; and that a united public opinion had been formed was emphasized in the passage of the $50,000,000 bond issue, which in a sense practically assured the completion of the East Michigan Pike or the Dixie Highway. Our various tours had interested the people of the "Soo", both Canadian and Michigan. Fred S. Case of the Michigan "Soo", a business man of big, broad ideas, worked so long and consistently, that the association was in reality compelled to recognize the "Soo" as the northern terminal of the road; he compelled us to visit our Canadian neighbors at that point. We had wondered what manner of men they were, rather feeling that the term Eskimo would perhaps describe them. We felt that the country north and east of them was a vast impenetrable wilderness, inhabited by wolves and other wild untamable creatures. Our surprise was great on our tour, these Canadians could not be shaken off, they boosted and boosted and we asked many questions. The one that stumped them all, however, was, "Can you get through to Toronto by automobile."

They did not know, neither did we; so we felt reasonably safe in telling them we would come up and make the trip if they would furnish the cars immediately. They said they would. Far be it from a real booster to back down, so we made the trip in September, 1919. Let me say that to Fred S. Case belongs the honor of having first suggested the idea of a completed road from the "Soo" to Toronto and the east. From the time I met him first, he talked it and talked it until I thought he had gone "daffey" on the subject. Our pathfinding trip was a success; we found a country and a people we had not thought possible, cities and towns and beauty spots. And the welcome they gave us: As an example, North Bay waited for our delayed party and we had our good roads meeting between 12 midnight and 2:00 a. m. At Espanola we were banqueted at 11:30 p. m. So we got through and thought not only that they were real people, but that the route was a feasible and practical one. Our determination to discontinue the tour was changed and the idea of a big International Tour was born.

Copying after the New England Ideal Tour it was felt that there was the opportunity to promote touring through a wonderfully beautiful and interesting country; the establishment of a route which would appeal to the touring public of the east as well as the great central west, as well as providing a link in another great transcontinental route.

The motorist of today has in his heart the lines of Henry Van Dyke in his "God of the Open Air:"

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[*] Presented at the annual meeting of the Michigan state Good Roads Association, Lansing, Mich., Sept. 1-3.

[†] Manager, Detroit Automobile Club, Detroit, Mich.

From the prison of anxious thought that greed has builded,
From the fetters that envy has wrought and pride has gilded,
From the noise of the crowded ways and the fierce confusion,
From the folly that wastes its days in a world of illusion,
(Ah, but the life is lost that frets and languishes there!)
I would escape and be free in the joy of the open air.

Coupling these lines with the words of President Wilson we immediately set about finding ways and means to extend our activities with the hope that an ideal might be fulfilled.

The Michigan Pikes' Association met, the Pathfinding Committee reported and their recommendation for an international tour adopted. W. D. Edenburn, a veteran of many tours, was elected tour manager, and from time to time he submitted plans. On July the 14th exactly at 2:30 p. m. the tour left Detroit with 40 passenger cars and 17 trucks, in all 225 people. The tour was organized as nearly along military lines as was possible and was self-sustaining. Trucks carried baggage, blanket rolls, tents, stakes and camp equipment. Three trucks were equipped with cooking ranges, a chef and cooks prepared breakfast and dinner. Sets of men were assigned to each tent and erected and cared for their own tent and equipment. One truck was equipped with a lighting system, wires were strung and each tent had its own light. A fire truck also accompanied the tour and was prepared to respond promptly to a call of fire. Another truck was equipped completely as an office for the use of the tour manager and his assistants. One truck carried spark plugs and another, tires.

In our minds we had questioned how the people of Canada would take the tour, but we found that they were just as keen as our own people, their reception and their interest being far greater than we had expected; in fact, our largest and most interested audiences were those in Canada, the Canadian Soo beating all with a record crowd, for them and for us.

That they were interested and entered into the spirit of the thing was emphasized when we found miles of improved roads and bridges, with many changes from that we found on the pathfinding trip. We know now that the big idea is assured.

Too much credit cannot be given to those men of the Sault Ste. Marie, and when I use that name I am not thinking of a river dividing two countries, but of a collection of people with lofty ideals, with nerve and pluck and energy, carrying in their hearts and minds the lofty ideals of brotherhood. Truly their monument is this accomplishment and I take my hat off to them in the spirit of the old, old world when it bowed at the feet of nobility, but with no thought of servitude and slavery.

Highway promotion is at best a thankless task. At first we were mountebanks, even yet we play that, and although it seems foolish it makes a laugh or a smile. Yet there is too much seriousness in us at times and a smile here and there does no harm. But we are thinking always of the broad highway in its loftiest sense and what it must mean to all of humanity, economically, socially and spiritually. If it were my lot to choose for my headstone I would pick those words of Jeffrey Fernol in his story, "The Broad Highway."

"As this life is a Broad Highway along which we must all of us pass whether we will or no; as it is a thoroughfare sometimes very hard and cruel in the going, and beset by many hardships, sometimes desolate and hatefully monotonous, so, also, must its aspect, sooner or later, change for the better, and, the stony track overpassed, the choking heat and dust left behind, we may reach some green, refreshing haven shady with trees, and full of the cool, sweet sound of running waters. Then who shall blame us if we pause unduly in this grateful shade, and, lying upon our backs a while, gaze up through the swaying green of trees to the infinite blue beyond, ere we journey on once more, as soon as we must, to front whatsoever of good or evil lies waiting for us in the hazy distance."

Highway Construction in Canada

The Province of Quebec, Canada, plans to spend $17,390,000 for road construction this season, of which the Dominion Government will give $5,000,000 and the balance will be contributed by the Provincial Government and the municipalities affected. The plans include the following highways:

Hull to Montreal; Montreal to Levis; Levis to Rimouski; Riviere du Loup to Edmudston; Montreal to Sherbrooke; Montreal to Malone, N. Y.; Montreal to Mont Laurier.

The Province of Ontario will spend $22,290,000 on its roads, the Dominion Government contributing $6,800,000, the Provincial Government $12,000,000 and the municipalities $3,400,000. The following highways will be improved:

Windsor to Coteau; Windsor to Fort Erie; Toronto to Sarnia; Toronto to Muskoka; Ottawa to Kingston.

The Province of Manitoba will spend about $3,000,000 on 4,000 mi. of roads. The highways to be improved are as follows:

Winnipeg to Rainy River; Winnipeg to Lake Winnipeg; Winnipeg to Emerson; Winnipeg to Reston; Winnipeg to Portage la Prairie; Brandon to Elkhorn.

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It is proposed to utilize Spanish labor in the state of Pennsylvania for the construction of state highways. Thousands of Spaniards are now emigrating to America because of labor troubles in that country, and efforts are being made to divert this new class of immigrants to sections where road work is under way.

Last of Federal Aid Fund Apportioned

By THOMAS H. MAC DONALD*

The last apportionment of federal funds to aid the states in road construction under the existing Federal Aid Act became available July 1. This is the largest apportionment yet certified under the Federal Aid Act, amounting to $100,000,000, three quarters of which is derived from the appropriation of 1919 and $25,000,000 from the original appropriation of 1916. A deduction of $3,000,000, or 3% of the funds, will be made to provide for the expense of administering the Federal Aid Act. by the Department of Agriculture. The balance of $97,000,000 will be divided among the states in proportion to their population, area and mileage of post roads. The allotments to the several states from the two portions of the fund are given in the table of apportionment printed herewith.

Under the law the states are required to enter into formal agreements with the Secretary of Agriculture for the construction upon which this money is to be used before July 1, 1922. Any money which is not taken up before that time will be reapportioned among all the states in the same manner in which the original apportionments were made. All previous apportionments have been taken up in the time allotted and it is not likely that the states will fail to absorb this last apportionment. To do so, however, will mean that the states must survey, plan and let contracts for at least $200,000,000 worth of federal aid road construction during the next two years.

If the states continue to pay more than 50% of the cost, as they have in the past, the cost of the roads constructed with this last apportionment may reach $250,000,000. In other words, it will be necessary to plan for construction at the rate of at least $100,000,000 and probably more per year. Some appreciation of what that means may be gleaned from the fact that in 1915 the expenditure for all roads in the United States constructed under state supervision, was only $80,000,000.

Since 1915, however, state highway departments have been greatly expanded, and efficient machinery has been developed which will undoubtedly be able to handle the greater volume of work.

The states have had four years in which to prepare for the expenditure of the large funds which now become available. They expect to be able to handle them. What is of greater concern to them at this time is the condition which may result if federal appropriations are permitted to lapse. The highway departments should know at least a year in advance what funds are to be available in order that plans may be made for future construction. Unless, therefore, federal action is taken in the coming year, the states will be left in doubt as to the future policy of the Government, and the amount of money they must be prepared to expend. Such a contingency would involve a serious setback to the progress of road construction and should be avoided by early congressional action.

The following table shows the last apportionment by states:

FEDERAL AID FUNDS FOR ROAD BUILDING WHICH BECAME AVAILABLE TO THE STATES JULY 1, 1920

State.	Apportionment of last installment of 1916 Federal appropriation.	Apportionment of last installment of 1919 Federal appropriation.
Alabama	$ 526,220.88	$ 1,578,662.63
Arizona	343,411.04	1,030,233.12
Arkansas	421,294.52	1,263,883.57
California	763,668.88	2,291,006.63
Colorado	438,939.79	1,316,819.38
Connecticut	153,337.36	460,012.07
Delaware	40,668.70	122,006.11
Florida	286,861.98	860,585.94
Georgia	674,287.74	2,022,863.22
Idaho	306,512.48	919,537.45
Illinois	1,091,266.98	3,273,800.93
Indiana	671,763.32	2,015,289.95
Iowa	720,332.18	2,160,996.56
Kansas	717,811.16	2,153,433.46
Kentucky	487,938.86	1,463,816.57
Louisiana	340,557.78	1,021,673.35
Maine	240,057.54	720,172.62
Maryland	216,749.65	630,248.96
Massachusetts	368,197.21	1,104,591.62
Michigan	722,916,99	2,168,750.98
Minnesota	710,522.33	2,131,567.00
Mississippi	451,889.29	1,355,667.88
Missouri	846,974.90	2,540,924.70
Montana	501,747.53	1,505,242.60
Nebraska	533,435.50	1,600,306.48
Nevada	319,086.11	957,258.32
New Hampshire	103,709.73	311,129.20
New Jersey	296,889.11	890,667.34
New Mexico	399,616.96	1,198,850.89
New York	1,242,973.28	3,728,919.83
North Carolina	569,763.45	1,709,290.35
North Dakota	384,056.95	1,152,170.85
Ohio	926,561.70	2,779,685.11
Oklahoma	575,619.58	1,726,858.75
Oregon	394,038.01	1,182,114.02
Pennsylvania	1,147,986.51	3,443,959.54
Rhode Island	58,314.22	174,942.65
South Carolina	359,004.76	1,077,014.28
South Dakota	403,944.86	1,211,834.58
Tennessee	565,478.48	1,696,435.42
Texas	1,465,399.62	4,396,198.84
Utah	282,393.91	847,181.75
Vermont	112,519.27	337,557.82
Virginia	494,418.46	1,483,255.37
Washington	361,156.95	1,083,470.84
West Virginia	265,038.19	795,114.58
Wisconsin	636,236.34	1,908,709.01
Wyoming	308,428.96	925,286.88
Total	$24,250,000.00	$72,750,000.00

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The National Park-to Park Highway, covering 4,500 mi. through eleven national parks in nine Western States, was recently dedicated and officially opened. Following the dedication the officials in charge started a tour of the highway.

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*Chief of U. S. Bureau of Public Roads.

Progress of Road Building in Michigan[*]

By FRANK F. ROGERS[†]

The Legislature of 1913 passed the so-called Trunk Line Act which provided for the laying out of some 3,000 mi. of trunk line highways which were designated in a general way by naming the cities and towns which would be connected by these roads, the exact routes between the towns to be determined by the state highway commissioner and local authorities. This mileage has been added to by subsequent Legislatures until now it embraces some 5,500 mi., of which 2,392 had been improved by July 1, 1920. In addition to that 4,917 mi. of non-trunk lines have been built by the counties and townships of the state, making a total of 7,309 mi. of improved state-aid roads.

The total amount of state rewards paid is $4,039,163. The Trunk Line Highway Act of 1913 further provided that the state should build all trunk line bridges of more than 30-ft. clear span. Under its provisions 154 bridges have been completed and in addition 62 bridges placed under construction, on which the sum of $1,988,202.89 have been paid up to July 1, of this year.

Another act which placed a large amount of work on the department is the so-called Covert Act, passed by the legislature of 1915 but which did not become workable so far as the state was concerned until amended by the legislature two years later. Under the provisions of this act the state has placed 375 mi. of roads under construction at a total cost of $3,976.-462.

The Federal Aid acts of 1916 and 1919 have made available for Michigan $7,961,295, in round numbers slightly less than $8,000,000. Three hundred and thirty-five miles of road at a total cost of $5,633,730 have been placed under construction under the provisions of the Federal Aid Act. Of these 69 mi. have been completed and money received from the Federal Government amounting to $915,363.31.

Notwithstanding the large amount of work entailed in the supervision of the work provided for by the Acts already named, the $50,000,000 bond issue voted by the people in the spring of 1919, followed by the so-called Aldrich Act (Act No. 19, P. A. 1919) which provided that "All trunk line highways, established under the provisions of Act No. 334 of P. A. of 1913, as amended, shall hereafter be constructed, maintained and improved in accordance with the provisions hereof, under the direction, supervision and control of the state highway department," has really been responsiblel for the very large expansion of the state highway department during the past year. Under the provisions of this Act 592 mi. of road at a total cost of $9,375,956 have been placed under construction. Up to date 55 mi. of these roads have been completed an din addition about 50 mi. have been completely graded on which no surfacing has yet been placed.

The organization of the department for carrying on this work consists of a commissioner, two deputies, one of whom is a lawyer and legal advisor for the department, and the other a civil engineer, as required by law, together with one chief engineer and his assistant who has charge of the advertising and letting of contracts; one chief bridge engineer with a principal assistant who has general charge of the field work; one supervisor of surveys and plans, and nine district engineers with enough assistants to properly carry on the construction work in their several districts.

With this organization which is really only an expansion of the organization which the department has had for several years, the work of advertising and the letting of contracts began. At first we were compelled to let contracts on only such pieces of road as the surveys and plans had been previously prepared for, but as soon as spring opened and the bond issue had carried, even anticipating final action by the legislature, surveying parties were rushed into the field and work began in earnest in preparing for the big task which the state highway department was to assume. In planning this work special efforts were and are being made to close such gaps in the trunk lines as would at once give long stretches of continuously improved roads; for example, the Grand River roads, now known as trunk line No. 16 running from Detroit to Grand Rapids and Grand Haven, viz, Lansing and Ionia. This road had 4 gaps, all of which will have been placed under construction and with a favorablel Fall, will be opened to traffic all the way through, before winter sets in. I am sorry to add, however, that the gap between Brighton and New Hudson will not be paved as first planned, but will be lightly surfaced with gravel and thrown open to travel and placed under trunk line maintenance until such time as it is possible to get cement for a paved roadway. Experience has proven beyond all doubt that it is very short-sighted policy to make heavy cuts and fills and pave over them the same year. In fact, most road builders are now thoroughly convinced that if only ditching and turnpiking is to be done, much more permanent results will be secured if the grading is done at least a year in advance of the paving and the road allowed to thoroughly compact under travel.

In many cases one course gravel will be immediately placed on the grade with a view to using the road two or three years before paving. The department has been accused of waste for this practice but assuming that such a base course costs $4,000 or $5,000 a mile, the saving in interest alone on a paved road at a cost of $40,000 or $50,000 a mile will soon pay for this surfacing.

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[*] Paper presented at the annual onvention of the Michigan Good Roads Association, Sept. 1, 1920.

[†] State Highway Commissioner, Lansing, Mich.

While the state has under contract at present more than $11,500,000 worth of work we are not putting on work as fast as we would, were it possible to get materials to the jobs, especially cement.

Up to date the highway loan board has authorized the issuance of $6,000,000 in bonds as follows: $1,581,000 of 15 year 4½% bonds, dated Nov. 1, 1919; $3,000,000 of 5 year 5% bonds, bearing date of May 1, 1920; $419,000 of 5 year 5% bonds, bearing date of June 30, 1920; $500,000 of 5 year 5% bonds, dated Aug. 1, 1920; $500,000 of 5 year 5% bonds, dated Oct. 1, 1920.

Last November we were able to get a premium of upwards of $28,000 on the first one and $500,000 bonds which were offered but today 5% bonds will not sell in the open market and the bonds which are now being sold are taken by individuals and banks in localities where the desire for the roads is greater than the desire to get the highest interest rate possible. In fact in some localities subscriptions have been taken to pay the difference between the current rates of interest on such bonds and the amount which the state can lawfully pay, which is limited to 5% at par. One of the problems confronting the next legislature will be to either raise the rate of interest sufficiently to move the bonds on the open market or to provide a special appropriation for carrying on the work.

At present the state's equalized valuation is $4,500,000,000, hence a one mill tax would yield $4,500,000 annually, which is only $500,000 less than the amount of bonds which may be sold each year under the bonding act.

Since the present bonding act calls for a levy of 1-5 mill this fall and 1-2 mill each year thereafter, it would not be a very great jump to go to one mill and thus temporarily avoid the necessity of selling bonds so long as the interest rates are high and the cost of road building proportionately great.

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Notes on Highway Bridges*

By M. A. LYONS†

The most difficult things to decide about a bridge are whether or not the bridge should be built and the proper size of opening. From the viewpoint of economy, when should a bridge be built? It is evident that the bridge must yield some real value to economically justify its construction. This value may be a saving of distance over which vehicles and persons travel or it may be a saving effected by an increase in the size of the load which may be hauled, due to its construction. As it costs about 35 ct. per team-mile to haul a load, it is seen that the money in cents which can be spent on a bridge in order to save distance is 35 times the team-mile saved. For example, if the construction of a bridge will save a travel of 5 mi. to 5 persons who have 40 loads to send to market each year, the total justifiable yearly expenditure would be $350. On a wooden bridge this would justify the expenditure of about $2,500, or on a permanent bridge of about $4,500. Likewise when the cost of motor traffic is 15 ct. per mile a saving of 2 mi. for an average traffic of 4 cars per day for 200 days per year would effect a yearly saving of $240, or, taking the two suppositions together, an annual saving of $570 which would justify the expenditure of $8,000 on a bridge lasting 30 years.

The amount of justifiable expenditure due to a saving effected by an increase in the weight of the load which can be hauled, by the construction of the bridge, will also vary as the traffic, and when the amount of the traffic is known, the economical expenditure can be ascertained.

This, however, is only the economic side, and is perhaps not as important as the social or civic side which cannot be estimated in concrete units but must remain a matter of personal or community judgment or sentiment. The economic consideration is, however, generally the one on which the engineer must base his decision. Sometimes, however, neither economy nor civic sentiment is the deciding factor, but vested rights or orders of courts may compel the construction of a bridge.

The determination of the area of waterway required is quite often a difficult matter. Various methods of determining this approximately are available: First, where there is an existing structure, by an examination of how this structure has fulfilled its duty; second, by evidence of men who are acquainted with water conditions at the proposed bridge site; third, by an examination of water levels as shown on the surrounding objects; fourth, by an examination of run-off data supplied by the Hydrometric Survey; fifth, by an examination of rainfall data supplied by the Meteorological Service; sixth, by means of formula; seventh, and most important, by means of several of these methods and common sense.

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*From a paper, entitled "Highway Bridges and Culverts," presented at the 7th annual convention of the Canadian Good Roads Association, Winnipeg, Man.

†Chief Engineer, Good Roads Board, Engineering Department, Province of Manitoba, Canada.

Where there are existing structures the problem is somewhat simplified, but not solved. On small creeks there is a tendency to underestimate rather than overestimate the size of waterway required, especially if some years have elapsed since a season of heavy run-off. Where only temporary structures are being placed this is perhaps not so important, but where the structure is to be a permanent one, care must be taken that the area is sufficient to provide for the greatest run-off which may take place. Too much dependence cannot be placed on the size of the existing structure, but information must be obtained as to the area required under greatest flood conditions. If a structure has successfully passed all water for a considerable number of years, including years of excessive run-off, we know that it is at least large enough, and information must be obtained as to actual flood conditions in order to determine whether or not the waterway area can be reduced, should this reduction prove economical. On the other hand, on large streams the high water mark has a tendency to move up a little beyond where the other man saw it. If definite marks of flood water elevation recorded by men living in the vicinity at the time of flood can be obtained, these are generally to be depended upon. From cross-section measurements of the valley and known flood elevations, the area of the required waterway can be estimated.

The water marks on surrounding objects are not a very accurate methods of determining flood water elevations. If a few years have elapsed since the season of heavy run-off, these marks may be entirely obliterated and any marks found be quite misleading. They are really only one indication, to assist in determining the area required. The most valuable and dependable records of all are those suppled by the Hydrographic Survey, where these go back a sufficient number of years. Unfortunately these records cover comparatively few streams and on most streams cover only recent years. They do, however, form a valuable guide in determining the run-off on streams other than the ones which are covered by their records. While not numerous, the Hydrometric Stations are fairly well distributed and the run-off of typical streams in various parts of the country has been recorded. Knowing the maximum run-off, the drainage area, the type of country constituting the drainage basin, an estimate can be made of the discharge of a stream of similar drainage basin, which estimate will be of assistance in determining the proper waterway. As an example, from the discharge record of the Valley River for 1913 (a year of heavy run-off in this portion of the country) the maximum discharge is found to be 3,500 cu. ft. per second. The discharge divided by the mean velocity of 4 ft. per second gives the area of the required waterway and this divided by the drainage area of 1,028 sq. mi. gives as the waterway required an area of .85 sq. ft. per square mile of drainage basin, for this particular stream. Knowing the drainage area of a similar stream and multiplying this area in square miles by .85, would give some idea of the area of waterway required for this stream. The Valley River rises in the southerly slopes of the Duck Mountains and runs fairly rapidly to Lake Dauphin and the discharge fluctuates rapidly. From a similar record of the Rat River, which flows through a comparatively level county, the discharge is found to be 1,030 cu. ft. per second, mean velocity 1.63 cu. ft. per second and drainage area 650 sq. mi., requiring a waterway of .98 sq. ft. per square mile of drainage area. In applying this method it is important to know that the records available on any river cover greatest flood periods and an accurate knowledge of the drainage basins is necessary. The drainage area of the larger streams can be ascertained from present maps with sufficient accuracy, but sufficient topographic information is not always available to apply this to smaller streams. The Topographical Survey's branch is, however, undertaking to secure information which will be very valuable for future studies along this line. A study of the records of the Meteorological Service will also guide the judgment in selecting a proper area of waterway. Reasoning from one drainage basin, where total maximum precipitation and maximum percentage of run-off are known, to a similar drainage basin for which meteorological records can be obtained, a comparative estimate of the maximum run-off of this basin can be made. There are also several formulas which can be applied under certain conditions to drainage areas, which will also be a guide to the judgment. With the exception of the testimony of dependable observances of flood conditions, and the actual record of the hydrometic surveys, the various methods mentioned serve only as guides for the judgment in selecting a proper waterway and all must be applied with common sense.

In selecting the type of structure, three factors will influence this choice, viz, economy, service and appearance, and of these the first two will generally, but not always rightly, be the deciding factors. It is impossible to estimate the value of the esthetic in design, and as this value cannot be expressed in concrete symbols it is frequently not understood. Consequently, beauty of appearance is not given full value in deciding the type of structure. It is a question how much additional money should be spent in order to achieve a pleasing appearance. One dollar alone has a very anemic appearance in these days, but where a few thousand of them are considered they have a very aesthetic appearance, more so to some than to others; but it is a fact that the cost of a bridge is soon forgotten while an unsightly bridge cannot be forgotten, for it remains as a constant unpleasant jar on the senses.

(Continued on Page 138)

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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SHOULDERS AND DITCHES

A very large portion of the highway mileage outside of cities and towns consists of earth roads. Except during a comparatively short time in the spring these roads can be—and frequently are—kept in fairly good condition for motor traffic. But the traveled path is often so narrow that automobiles or trucks can pass only by turning out on the shoulders. And long after the roadbed has dried out in the spring these shoulders remain wet and spongy, constituting an annoyance and often a danger to the users of motor vehicles.

Many roads of this kind are not sufficiently important to justify widening the traveled path enough to permit cars and trucks to pass freely. The roads bear a light traffic and the money necessary to make them into double-track roads can be spent to better advantage in other ways. At the same time, few of them are so unimportant as to justify leaving them in such condition that when two cars meet, one of them is obliged to back to a place that happens to be of more than average width or else both must turn out on the shoulders and perhaps get mired in an attempt to pass.

The remedy, of course, lies in taking care of the shoulders, but in too many places these important parts of the road receive very little attention. Much can be done to improve conditions by taking care of the existing drainage facilities and by adding to them. Further improvement can be effected by rebuilding the shoulders with material that drains quickly, doing the work with as much care as should be exercised in the construction of the roadway proper.

Motor traffic governs—or should govern—road construction and maintenance in most localities. The operators of motor-driven vehicles pay, directly and indirectly, a very large part of the cost of road betterment and are entitled to corresponding consideration.

LIGHTS FOR ALL VEHICLES

Most states have enacted strict and explicit laws regulating lights on motor vehicles. In many cases there are also laws providing for the lighting of horse-drawn vehicles. The former are enforced; the latter frequently not.

For their own safety, even more than for the safety of the occupants of automobiles, drivers of horse-drawn vehicles should be obliged to provide lights. The driver of an automobile can not hear a team above the noise of his own vehicle and while his lights ordinarily show it to him in time to avoid running it down, he does not have the warning of its proximity that he is entitled to have.

There is need of adequate laws governing the lighting of horse-drawn vehicles and also of measures for the enforcement of those already on the statute books. Both of these are matters to which automobile organizations might well direct their efforts.

ROAD BUILDING NOMENCLATURE

It is inevitable that there should be a certain amount of confusion in the use of the special terms applying to an art like road building that has undergone great changes in a comparatively short period. But these circumstances constitute no sufficient excuse for the looseness of expression often found in descriptions of road work.

Probably because the greatest developments have been in bituminous construction, the terms peculiar to that branch of road work are the ones most generally misused. Among the most common errors of this type is the use of the word "asphalt" or "asphaltic" for "bituminous" and of "bitulithic" and other trade names to designate the whole class to which the type properly described happens to belong.

Another common cause of misunderstanding is the employment of localisms which convey to readers in some sections meanings entirely different from their true ones.

The meanings of road building terms, like those of terms of all kinds, will become fixed firmly only gradually by usage. At the same time, it is possible to accelerate that process, and efforts in that direction should be encouraged.

Notes on Highway Bridges

(Concluded from Page 136)

In selecting the economical type of bridge, cost of construction, upkeep and value of non-interruption of traffic, must be considered. The timber structure is in about every case the cheapest in first cost, but in the long run does not generally prove to be as cheap as steel or concrete. A wooden pile bridge, if suitable for the site, is no doubt the cheapest bridge in direct cost. For example, a 50-ft. pile bridge will cost today about $1,500. Allowing 6% interest, a yearly payment of $270 would be required to keep this bridge in condition, made up as follows: Flooring, to be renewed every three years, first cost $270 and yearly payment for three years $101; stringers, to be renewed every six years, first cost $270 and yearly payment $55; remainder of bridge to last 12 years, first cost $960 and yearly payment $114—total yearly cost $270. Indirect costs, such as delay to traffic during repairs, loss of traffic through neglect of repairs, liability to accident or fire, may run the total cost far beyond the direct costs. At best the pile bridge is very unsightly and only to be considered where first costs are of prime importance, as they sometimes are.

In many cases stream conditions are such that it is not permissible to have piles in the stream bed, and a clear opening of long span is required. The type of structure may then be a choice between a wooden span, a steel span or a concrete span. Unless the wooden span is to be placed on piles, which in many cases is not feasible, the cost of the substructure for the three types will be about the same, so that it will only be necessary to compare the relative costs of the superstructure. * * * * *

For bridges of any size, it is impossible to make any general statement that one class of bridge is cheaper than another, as every bridge is a problem in itself. The question of the nature of the foundations, cross-section of the stream bed, condition of stream flow, waterway required, availability of materials, relative cost of materials, relative cost and availability of labor, relative cost of substructure to the superstructure, ice conditions, and economical and suitable length of span must be taken into account when deciding which is the economical bridge. Wooden bridges are confined chiefly to two types, the pile trestle and the Howe truss. For steel bridges of clear span of 30 ft. or under, simple stringer spans are cheapest; from 30 ft. to about 45 or 50 ft., plate girders; from 50 ft. to 80 or 90 ft., low or pony trusses; up to 400 or 500 ft. trusses with sub-divided panels; beyond this, cantilever or suspension bridges; with steel arches coming in any place in the list.

Every concrete bridge is a study in itself. In Manitoba, there have been constructed or are under construction, slab and girder bridges up to 30 ft. span, through girders up to 50 ft. span, barrel arches up to 100 ft. span, open spandrel arches up to 60 ft. span, through arch or rainbow type up to 90 ft. span and bow strings up to 90 ft. These are, however, only given as examples of different types of concrete bridges.

In appearance, concrete bridges can be made to surpass any other class of bridge. They can be poured into any form, beauty lying in lines and not in ornamentation. They offer every opportunity for their designers to bestow upon their country a thing which will be a constant pleasure to beholders and which will be in mind long after the cost is forgotten. To my mind, there is another strong argument for the use of concrete and it is that the materials used in the making of concrete are almost without limit. The time when our timber will be exhausted can be foreseen. Iron ore is limited and can never be replaced.

All bridges should be designed by competent engineers. The design of ordinary steel bridges is so standard that there is very little difficulty about getting a suitable bridge after it has been decided what loads it may be called upon to carry. The decision as to the proper loading is one which will require careful study, but in the end must remain largely a matter of judgment. The tendency up to the present has been an increase in the weight of loads carried on highways. Many bridges have been discarded recently, owing to the fact that they were not heavy enough for present traffic. In western Canada the heaviest likely load appears to be a large tractor. In Manitoba we design our floor systems for a tractor load of 18 tons plus 30% impact and our trusses for a load of 100 lb. per sq. ft. The tendency appears towards lighter tractors rather than heavy ones. Before these bridges are worn out, however, some of them may be called upon to support heavy truck loads, but it is doubtful if these will ever exceed 18 tons.

The design of the foundation is most important. The bearing power of different soils varies so greatly and similar soils vary so greatly under different conditions, that careful examination must be made of the soil in order to properly design a foundation. It is a strange fact that there are probably less data on the variable factors in the behavior of soils than on most other materials of construction and, therefore, the assumptions made in the design of foundations are largly a matter of experience and judgment.

The design of reinforced concrete structures is not so standard as the design of steel bridges, and structures should not be considered which have not been designed by a competent and experienced engineer.

Proper construction is just as essential as proper design. Great care must be taken in the selection of the material. For steel bridges the material rolled by the steel mills is so nearly standard that for ordinary bridges no hesitation need be had in accepting structural shapes. But in order to eliminate poor field riveting, enlarged rivet holes made by drifting in erection and other faults which may produce stresses for which no provision has been made, all shop work should be carefully inspected before the materials are shipped to the job.

In reinforced concrete work the inspection must needs be more rigid. The cement should be subjected to standard tests before it is used. The making of cement is a delicate process and any one of several factors entering into its manufacture may cause a variation in the product. Especial care should be given to the selection of the aggregates. These must be well graded and absolutely clean. It is probable that more failures occur through the use of improper aggregates than from any other cause. The water used must be clean, and just the right proportion of water must be used. Professor Abrams has shown that the proportion of water to cement is one of the big factors affecting the strength of concrete. The amount of water used should be just enough to make a workable mix, and any greater proportion of water rapidly decreases the strength of the concrete. There is only a certain amount of water required to cause the setting up of the cement and it is quite evident that any amount beyond this, when it has dried out, leaves voids in the concrete.

The inspection of the steel is also very important; not only as to quality but that the bending is done according to plans. It is quite a common idea that any sort of steel will do for concrete reinforcing, but such is not the case. This steel is designed to take its share of the stresses fully as much as the steel in a steel bridge. The steel must occupy the exact space it is designed to occupy, for otherwise it is entirely useless in the structure. For this reason, the bends shown in the plans must be strictly adhered to.

It is also important to have experienced contractors for concrete work; and just as important as inspection of the material is inspection of construction. The inspector must be a man who knows his business better than the contractor and who has sufficient tact and judgment to get the work properly carried out without undue hardship to the contractor. It is a mistaken idea that any person will do for an inspector.

The form work is very important in concrete work, as it must be strongly built to withstand the pressure which will come upon it and also must have a smooth surface, for every flaw in the forming shows up in the finished structure. Careful ramming of the concrete is necessary in order to make a dense concrete, prevent voids forming next to the forms, and to cause a close bond between the concrete and steel.

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Dow & Smith, consulting paving engineers, have announced the opening of an office at Columbia, S. C., with T. K. Legare in charge.

To Boost Good Roads in Missouri by Means of the Movies

The good roads question is agitating the state of Missouri at the present time. At the next election road improvement bonds are to be voted on and in order to secure favorable action on the part of the voters, the subject will be thoroughly presented between now and election time.

One of the methods to be employed in getting the subject before the voters will be the use of the motion picture and to this end a one reel film has just been produced by the Rothacker Film Co., of Chicago. The film will feature road improvements now under way near the cities of St. Louis, Kansas City, Springfield, St. Joseph, Joplin, Sedalia and Fulton. In order to make the film, the Rothacker cameraman visited the counties of Cole, Jefferson, Callaway, Pettis, Clay, Vernon, Jasper, Christian, Lawrence, Mississippi and Scott.

In the picture, voters will learn that the Missouri State Highway Department has laid out a 6,000 mi. system, with two state roads in each county, connecting with state roads in adjoining counties of which 4,075 mi. had been surveyed up to Aug. 1, last.

Counties and road districts have voted $22,200,000 in road bonds to match state and federal aid in building roads.

The State Highway Board has approved 1,783 mi. of state roads, of which only 127 mi. are to be of graded earth. The estimated cost of this mileage is $18,000,000.

The film is designed to be educational in every way. For this reason the construction of various types of roads will be shown together with the different kinds of machinery required in highway construction.

Up to Aug. 1, the state highway board had approved plans and specifications for 62.5 mi. of state road, divided into 57 projects, to be constructed at a total estimated cost of $9,000,000. The Federal Government had approved 449 mi. covered by these plans at a total estimated cost of $7,907,229.91.

Notwithstanding labor and transportation difficulties and the high cost ,the Missouri SState Highway Department has 390 mi. of gravel, waterbound macadam, bituminous macadam, asphalt macadam, chert and concrete roads under construction. The total construction cost of this mileage is $4,600,000.

Having provided finances to take care of the Federal aid available for Missouri, the state highway department is now bending every effort to improve the state roads in counties that were unable to provide funds for matching Federal aid, but which, under the law, are entitled to $1,200 a mi. free on not less than 50 mi. of state road.

Arrangements have been made by Douglas R. Rothacker with the Central Film Co. of St. Louis and S. W. Hatch of Kansas City to book the road picture in the theatres throughout the state of Missouri.

Reorganization of the Engineering College, University of Maryland

We are indebted to H. C. Byrd, Assistant to the President, University of Maryland, for the following in regard to the reorganization of the Engineering College, and the appointment of A. N. Johnson, as Dean and Director of the Engineering Experiment Station of that university:

"Linking up of its engineering work with the State Roads Commission and with the Bureau of Public Roads of the United States Government and the appointment of A. N. Johnson, Consulting Highway Engineer for Maryland and Illinois, to be Dean, are the first steps in the reorganization of the Engineering College and the strengthening of the general engineering work of the University of Maryland.

"An arrangement was recently completed with the State Roads Commission and the Bureau of Public Roads, whereby, an engineering experiment station will be established here and run in connection with the Engineering College, under the direction of the new Dean.

"The new arrangement was effected after a series orf conferences between John N. Mackall, Chairman State Roads Commission, H. M. McDonald, Chief of Road Work for the U. S. Government and Dr. A. F. Woods, President of the University of Maryland. The new arrangement will go into effect Oct. 1, and Mr. Johnson will assume his duties at that time.

"Mr. Johnson will come to Maryland with a full knowledge of Maryland conditions and with a reputation of being one of the best civil engineers in the United States. A graduate of Harvard, Mr. Johnson began his career as a member of the faculty of that institution. Since 1897 when he became a member of the national highway commission he has been concerned directly with practical engineering projects. From 1898-1904 he was state highway engineer of Maryland; in 1905 became chief engineer, U. S. Office of Public Roads; from 1906-1914 was state highway engineer of Illinois; and in 1915 was highway engineer, Bureau of Municipal Research, New York, and since 1916 has been consulting highway engineer of the Portland Cement Association with offices in Chicago and Washington.

"Mr. Johnson has written numerous articles regarding highway engineering matters and has compiled a digest of all highway laws and statutes. He has given numerous lectures on highway and general engineering in the principal universities and scientific societies and commercial organizations in the United States. His numerous investigations and researches in various phases of highway construction and technology are regarded among the foremost in the world.

"Mr. Johnson is a member of the American Society of Civil Engineers, American Society for Testing Materials, Western Society of Engineers, director, American Association of Engineers, Permanent International Association of Road Congresses, American Municipal Improvement Association, and American Concrete Institute.

"In speaking of the future of the engineering work at the University, President Woods has this to say:

"A great field is open for the development of Engineering, as the present output of the engineering colleges is not sufficient to meet the demand for trained men. In obtaining Mr. Johnson to head our College of Engineering, I believe that we have been extremely fortunate in procuring the services of a man who has had a broad experience in practical engineering and also an experience of five years in teaching at Harvard. This combination is unusual and seems to me to be almost ideal for the Dean of the Engineering College. I have had numerous requests from the western part of the state for trained men along engineering lines, especially adapted to the conditions of that section. It is the intention of the institution to develolp a department in its engineering college to meet that demand.

"Mr. Johnson's title will be Dean of the College of Engineering and Director of the Engineering Experiment Station."

Good Work in a Louisiana Parish

The voters of Webster County, La., voted overwhelmingly in favor of a proposal to levy a special tax of five mills on themselves for two years in order to finance good road work in that section. There was opposition, of course, but the margin by which the objectors were snowed under was more than wide enough to prove most conclusively that the voters of the parish regarded the good roads proposition as good business.

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The Connecticut State Highway Department has moved its offices to 240 Farmington Ave., Hartford, Conn.

Seneca County, Ohio, has sold five issues of road bonds aggregating $258,000. The bonds bear 6% interest and were purchased jointly by the Tiffin National and Commercial National Banks at par and accrued interest.

At the regular meeting of the board of directors of the Locomobile Co., held Sept. 1, the regular quarterly dividend of 1¾% on the preferred stock was declared. This will be payable Oct. 1 to stockholders of record Sept. 15.

Montgomery & Co., of Philadelphia, have been awarded by the Schuylkill County Commissioners the $970,000 bond issue of that county. The local commissioners will pay a little over 5% interest on these bonds. The money will be used in building a new county highway to connect with the new state highway, also for the construction of several new concrete bridges.

EQUIPMENT—TRADE—MATERIALS

The Koehring Rotary Grader

The Koehring rotary grader can be used advantageously not only in excavating for road grading, but also for tearing up old macadam pavements. The accompanying illustration shows one of these machines in operation for such work on a city street in Milwaukee, Wis.

The machine excavates from 600 to 1,000 cu. yd. of earth a day, dependent upon the character of the earth, the depth of cut and number of available teams or trucks. Moving forward under its own power, it cuts out the roadbed, elevating and loading the material into trucks or wagons alongside the excavation.

Digging is accomplished by a rotating cylinder upon which are mounted 12 herring-bone shaped buckets carrying rooting teeth on their cutting edges. The excavated material is carried up by the buckets as the cylinder rotates and is dumped upon the belt of the delivery conveyor, installed to extend at right angle out from the grade on either side so as to discharge the material directly into wagons, trucks or cars. The cutting wheel is adjustable to make a cut from 1 in. to 2 ft. deep, the cuts being 5 ft. 7 in. wide. While the digging wheel is in action, the entire machine moves forward under any of four speeds, according to depth of cut and character of material.

KOEHRING ROTARY GRADER

Control is completely centralized in the operator's cab, from which the cutting wheel is raised or lowered, the machine sent forward at various speeds, or reversed. Short turning is accomplished by separate control for each set of caterpillars, thus enabling one set to "walk around the other," and to turn the machine in its own length.

Actual performances show that this machine effects a large saving of labor. When it is realized that the maximum capacity of hand shovel labor is 5 wagons per day and that the Koehring rotary grader will readily load 600 wagons or more per day, the reduction of operating costs is apparent. In addition, this machine reduces the time taken to complete a job and so permits the contractor to secure greater profits from his capital invested.

The Koehring rotary grader is manufactured by the Koehring Machine Co., Milwaukee, Wis.

Onondaga County, New York, Improves Highways on Big Scale

County Finds Allies to Progress in Its Limestone Quarries and White Truck Fleet

Back in 1911 the Board of Supervisors of Onondaga County, New York, began an intensive road building program and in eight years have constructed 145 mi. of improved highways. The program for this year calls for 50 additional miles of improvements.

Having determined upon an extensive road building program, one of the first big problems in the path of progress was the necessity for installing hauling equipment capable of transporting the immese tonnages of materials. On the recommendation of the county superintendent, White trucks were selected for the transportation of road materials. In 1918 when a lack of freight cars threatened to hamper road work, five additional White trucks were purchased, making a fleet of 19 White trucks owned by the county, of which number 14 are used in road work. Ten of these 14 trucks are 5-ton dump trucks and the other four are ¾-ton models, used in hauling men and tools, and in repair work.

WHITE TRUCKS AT WORK IN ONONDAGA COUNTY'S LIMESTONE QUARRIES

The county owns limestone quarries at Jamesville, located at about the center of the county, from which an average of more than 20,000 tons of stone are transported each year to the roads of the county.

The accompanying illustration shows a few of the trucks about to leave the quarries. Often deliveries must be made to roads close to the county line, 20 mi. from the quarries to the north and west, 13 mi. to the south and 8 mi. to the east. Trucks on this work average 70 mi. a day throughout the season.

Trailer Manufacturers' Discuss the Problems of Manufacturing and Transportation

An all day session of the members of the Trailer Manufacturers' Association of America was recently held in Cleveland, O.

Reports showed that the manufacturers have still a considerable volume of unfilled orders on their books that will keep the factories busy for some time. Foreign orders were reported coming in at a good rate.

Among the subjects discussed were cost accounting in the factory, standardization of trailer construction, reduction in the number of trailer models, legislation, patents and service. It was brought out that several members had already materially reduced their models.

The meeting approved the design for the slogan "Truck by Trailer," which was adopted as the official slogan of the trailer industry at the meeting held last May.

It was unanimously voted to double the initiation fee and annual dues in the association beginning the first of the new year.

Among the members of the association it was felt that the 40% freight increase adopted by the railroads will work no material hardship on the trailer business. While the increased rate will add to the cost of parts and materials, and to the freight bills on finished trailers, it is believed that industrial and commercial concerns will turn more and more to motor trucks and trailers for short distance hauls.

One of the latest and most unique developments in the trailer field is the use of the trailer train for transportation purposes. The Pacific Telephone & Telegraph Co., of California, recently bought seventeen trailers to be hauled in trains of four or five by a road tractor, and to be used by workman in erecting telephone and telegraph lines remote from cities. The trailers are fitted with regular car bodies, 8 ft. wide and from 12 to 24 ft. long. Some are used for sleeping quarters, others as dining cars, and others as offices, while some are work cars for hauling poles, wire and other material.

The sleeping cars have full-size single berths, wash room, shower bath, etc. The dining cars have a horseshoe counter at one end with seats for 14 men, and at the other end is a complete kitchen, including range, ice chest, dish closet and a sink with hot and cold water.

Each train is composed of a diner, two sleeping cars, a combination office and sleeping car and a water tank and tool trailer. The telephone company believes this method of housing and feeding its men while on outside construction work will solve one of its most difficult problems—that of transportation.

MEETINGS

Calendar of Coming Meetings

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

PERSONAL MENTION

A. H. Sjovall has been appointed assistant city engineer of New Britian, Conn.

C. H. R. Fuller, of Toronto, Can., has been appointed city engineer of Chatham, Ont.

Charles Warren Hunt has been made secretary emeritus of the American Society of Civil Engineers.

Alfred H. Sauerbun has been appointed chief of construction of the State Highway Department of Pennsylvania.

Drury Butler has been appointed county engineer of Sacramento County, California. Mr. Butler was formerly surveyor of that county.

Donald M. Hepburn, formerly of Carlisle, Pa., has resigned as chief of construction of the State Highway Department of Pennsylvania.

F. S. Wheeler who was formerly resident engineer of the State Highway Commission of California, is now associated with the producing department of the Standard Oil Co.

John T. Edwards, of Trenton, N. J., a brother of Governor Edwards, has been appointed by the State Highway Commission to the position of supervisor in the State Highway Department.

J. R. McDermott has accepted a position with the West Virginia State Road Commission as assistant division engineer. Mr. McDermott's headquarters will be at Keyser, W. Va. He was formerly assistant highway engineer of Harrison County, Ohio.

OBITUARY

P. R. Regnier, engineer with the California State Highway Commission, was recently drowned near Dunsmuir, Cal.

J. G. Leyner, inventor of many rock drilling appliances manufactured by the Ingersoll-Rand Co., was killed in an automobile accident near Denver, Col. Among the important inventions of Mr. Leyner is the drill sharpener, which is used in sharpening about 90% of all machine sharpened steel in the world.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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*Illustrated article

AMERICAN HIGHWAY ENGINEERS' HANDBOOK
By Arthur H. Blanchard
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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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JAMESTOWN, N. Y., SEPTEMBER 22, 1920

Number
12

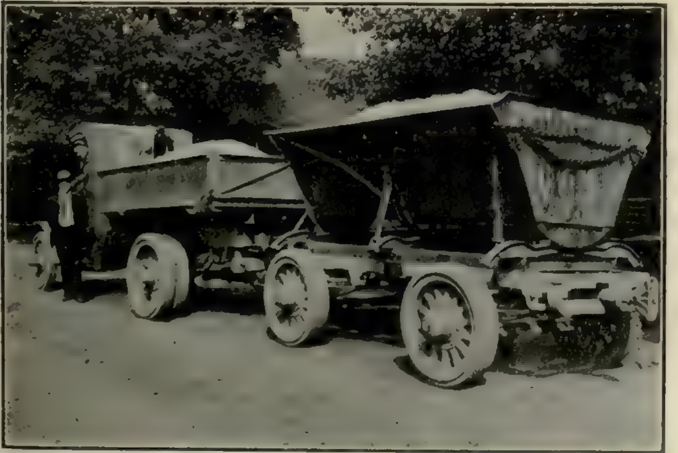
The Trailer as a Transportation Problem Solution

By W. C. PATRICK*

It is safe to assert that most of the motor truck and tractor users of this country have transportation problems to which they are earnestly seeking a real solution; the problem being, "How can I get the most profitable results from the highly efficient power unit which I have?" There is almost always a surplus of power over and beyond that which is necessary to operate under capacity loading even when road conditions are not the most favorable and where grades are fairly heavy. Most people realize that this surplus power is available but have never found a satisfactory means of utilizing it and after unsuccessful attempts to get the answer have become skeptical about new ideas and schemes which might be suggested.

This causes one to wonder if any considerable part of the great number of men interested in transportation have come to appreciate fully the progress and development of the trailer and the place it has won for itself in the transportation field. The trailer industry is of no mean proportions, despite the fact that the number of years which have passed since the inception of the trailer represent but a very small part of the time which has passed since motor trucks were first developed. The trailer's progress had been much more rapid than that of the motor truck, reaching a state of perfection even beyond the highest hopes of the manufacturers a few years ago. This was not easily attained nor was it attained without considerable expense, gruelling work, and exhaustive tests. I am fully aware that those of us who for so many years have watched a single locomotive successfully drawing behind it great trains of loaded cars up grade over its steel roadway, have regarded the matter as quite simple. In principle it is simple, this trailer idea, but in practice, so many serious difficulties have been encountered and so many theories failed to yield themselves to practice it has required a stout heart and a clear vision at times to persevere.

The trailer manufacturers early learned that the trailer required and called for the highest type of engineering skill in order to become a success and that lesson has proved of untold value to both maker



MACK TRUCK WITH TROY TRAILER OPERATED BY THE STREET DEPARTMENT, SALT LAKE CITY

CATERPILLAR 10-TON TRACTOR AND REVERSIBLE TROY WAGONS IN OPERATION NEAR HENRY, ILLINOIS and user alike. It is not enough that this vehicle should be merely strong enough to sustain the weight of its load, it must be so constructed that it can be easily attached, and easily detached from the towing truck, must track behind the truck perfectly, be of light draft and to withstand and absorb road shock without transmitting but a very small percentage of this shock to the towing motor, for there is nothing more disastrous and expensive than attempting to tow a "dead load." All these things called up the best effort of the makers before they were eliminated, but the successful operation of trailers in hundreds of different lines of business and in connection with practically every motor truck of standard design and construction shows the rapid success of the trailer.

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*Field Manager, the Troy Wagon Works Company.

Recently a coal dealer said to me in speaking of the use of a trailer which was especially designed for use in his particular line of business behind a standard make of truck, "It is a life-saver for me. The coal shortage has intensified the demand for coal to such an extent that it is imperative to increase the hauling capacity of each of my trucks. Traffic conditions in my city are so congested that regardless of power I am only able to make so much speed with my truck and by attaching my trailer I can make the same speed and deliver double the quantity of fuel at a very small increase in fuel consumption." That is something worth thinking about. One hundred percent increase of capacity with only a slight additional operating cost. Loggers have found that wherever it is necessary to use teams to get the logs to the road, they can transfer the logs to truck and trailer and by this means greatly speed up deliveries to the mill and increase production at a very small cost, thus eliminating the old slow moving team. In construction work, extremely long beams and bridge spans have been loaded on to trucks, each of which have a single trailer attached, and by that means a difficult bit of transportation has been simplified, deliveries speeded up and costs reduced where a single truck would have been impractical and slow moving team equipment with its great operation cost eliminated. In road construction it has been found practical and economical to deliver to the sub-grade materials on trains of trailers that are either drawn by motor trucks or tractors, thereby eliminating a great waste of time and money which would be experienced if the antiquated teaming equipment were used. It was recently shown by a large roadbuilding firm in one of the southern states that on two stretches of road under construction, each of which was approximately 15 miles long, that tractor-drawn trailers employed on one job would save in prevention of loss of time by the roadbuilding crew, prevention of the necessity for additional handling of materials, and continuous operation, an amount equal to twice the cost of the equipment when compared with the results obtained on a like job where team-drawn equipment was used.

In the garbage disposal problems, which confront practically every city of any size in this country, the trailer is destined to play a conspicuous part and already a number of municipalities are motorizing their street cleaning and garbage disposal departments and adopting the truck-trailer method of garbage and refuse disposal with signal success and saving.

What has been accomplished in the past is only an indication of what the future holds for this younger of industries allied with gasoline motor construction.

Dismissal of H. K. Bishop Scored by Indianapolis Engineers

The Indianapolis Chapter of the American Association of Engineers recently passed a resolution condemning the action of the Indiana State Highway Commission in discharging H. K. Bishop, Chief Engineer of Construction. The resolution is as follows:

"Whereas, Recent press notices advise of the dismissal of the chief engineer of the Indiana State Highway Commission and the reason given is that it is thought possible to obtain an engineer to fill his place at a materially reduced salary, thereby saving money for the state; and

"Whereas, The responsibility, magnitude and class of work attached to this position are such that it requires executive ability by an engineer of the highest type, who should be paid in accordance with the standards obtaining in other engineering work, and which would thereby entitle the position to higher rather than a lower salary, and

"Whereas, The dismissal of an executive officer for such a reason as assigned is certain to disrupt the organization by lowering its morale and efficiency, and thereby proving expensive rather than economical to the public; therefore, be it

"Resolved, That we, the American Association of Engineers, The Indianapolis Chapter, do condemn the action taken by the Indiana State Highway Commission for the reason assigned; and be it further

"Resolved, That copies of this resolution be given to the Indiana State Highway Commission."

Striking Miners Find Work on Highways

The anthracite miners on strike near Shamokin, Pa., are finding employment on state roads which are being constructed in that locality. With the suspension of work at the mines, hundreds of idle miners have accepted employment with road contractors. The contractors provide automobiles for the transportation of the men to and from their work and pay the men, it is reported, a higher wage than the anthracite coal commission would give the miners. As a consequence, it is thought that many of the miners will continue in road building as long as the weather permits, even in the event of the mines resuming operations.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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ESTHETIC CONSIDERATIONS IN ROAD AND BRIDGE WORK

As a general thing very little attention is given to the esthetic in the design and construction of highways and highway bridges. In most cases the consideration given to it is too little.

Reference was made to this point in connection with the building of highway bridges in a paper printed in the issue of Sept. 15—"Notes on Highway Bridges." The author, M. A. Lyons, of the Manitoba Engineering Department, points out that the choice of the type of structure to be built is influenced by three factors—economy, service, and appearance—and that the first two are "generally, but not always rightly" the deciding ones. Continuing, he says:

"It is impossible to estimate the value of the esthetic in design, and as this value can not be expressed in concrete symbols, it is frequently not understood. Consequently, beauty of appearance is not given full value in deciding the type of structure. It is a question how much additional money should be spent in order to achieve a pleasing appearance."

It is granted that both highways and highway bridges are primarily utilitarian in purpose. So are buildings and many other things men build and adorn. It is true that the esthetic can not be evaluated precisely, yet it should be evident that good appearance does have a real value. And in things so much seen and seen by so many people as are roads and bridges this value is proportionately enhanced.

There are thousands of miles of highway to be built and their building will require millions of dollars and much time. Because of the urgency of the road betterment program, comparatively little can be spent for beautification. At the same time the esthetic should be considered, not ignored, especially since much can be accomplished without any sacrifice of the utilitarian.

AUTOMOBILE ACCIDENTS AT GRADE CROSSINGS

The season of automoble accidents is here, as may be proven by reference to the daily press, especially on Monday mornings. A no inconsiderable percentage of these accidents occur at railroad grade crossings and though the driver is usually at fault, the number of accidents would be much less than it is if the crossings were made as safe as they might be made at a comparatively trifling expense.

Most existing crossings are relics of a past age in transportation. When they were built they were not particularly dangerous to the existing traffic. The careful driver obeyed the injunction to "stop, look and listen," if it seemed necessary, and satisfied himself before crossing that there was no train coming. The less cautious trusted to their sight and their ability to hear an approaching train above the noise of their own vehicles, and crossed without stopping. These precautions were usually ample, for few horse-drawn vehicles were noisy enough to drown the roar of a train dangerously near or the warning ring or whistle of the locomotive.

Under the circumstances, road builders did not hesitate to bring the road to the track on a steep grade, to leave high banks or trees or underbrush where they would obstruct the view along the track, or to make three crossings on a stretch of road that at a slightly greater cost could be built with but one.

Most drivers of motor cars stop only when necessary and the number who take the precaution to bring their machines to a full stop before crossing a track is so small as to be entirely negligible. The driver, however, can not so safely rely upon his hearing to give warning as can the driver of a horse-drawn vehicle, because his vehicle is often noisy enough to prevent his hearing a train unless it whistles. Moreover, the speed at which the car approaches the crossing gives him less time to look up and down the track—if, indeed, he has an unobstructed view—and he is obliged to give more attention to driving than the driver of a team has to give.

Though the cost makes the elimination of railroad grade crossings a work that will require years, there is much that can be done at little cost and with great benefit to motor traffic. The most effective safeguard—and often the least expensive—is the providing of an unobstructed view each way along the track. This may be done by cutting trees or bushes, by removing projecting banks or by relocating a section of the road. Any one of them is well worth while.

Maintenance Policy of the Wisconsin State Highway Commission*

In planning the maintenance of the state trunk highway system, the Commission decided at the outset to install a thorough system of patrol maintenance, supplemented in practically all counties by small gangs for reconstruction and heavy repair work.

The Commission did not advocate the promiscuous regrading of all roads on the system immediately. Those that could be maintained reasonably well by ordinary patrol maintenance method were permitted to wait a year or more until the necessary funds were made available for this purpose.

Sections of the system that lacked drainage, cuts and fills that were dangerously narrow, dangerous turns, and surfaced roads that required additional shoulders and resurfacing received attention as early as possible, in order to get the best results under the patrol system.

The additional 2,500 mi. authorized by the Legislature of 1919 have been selected by the Legislative Committee and the Highway Commission and will be handled in all ways the same as the original 5,000 mi. were handled.

In certain sectons of the state, especially in undeveloped portions of northern Wisconsin, there are portions of certain new trunk highways that will not be maintained for one or more seasons. The portion not to be maintained for 1920 amounts to about 300 mi. and in practically all cases there is no road that is fit to travel at the present time. As soon as a road has been laid out and is in reasonably fit condition for a patrolman to maintain, it will be taken over for maintenance.

The following specific policies were put into effect:

1. The system lying in each county is divided into patrol sections, averaging from 6 to 8 mi. in length.

2. A patrolman is engaged for each section, who devotes all his time to the work for the entire maintenance season, which is about seven months in northern counties and eight months in southern counties.

3. Patrolmen are paid a monthly salary sufficient to attract good men. The patrolman must furnish a satisfactory team and wagon, the county furnishing a light blade grader, road planer, plow, slip scraper nl other necessary tools.

co. The patrolman is responsible for the maintenance of his section, and where extra help is necessary to adequately maintain any particular section, it is furnished by the county, but the work done under the direct supervision of the patrolman. The basic idea is to place responsibility "on one man only, the patrolman."

5. The patrolman reports daily and monthly to the county highway commissioner, showing the hours worked and their distribution. The monthly reports are forwarded to the divison engineer's office by the county highway commission, and show the cost and distribution of both labor and material used on each section. These reports must be received by the county highway commissioner before the patrolman's salary will be paid.

6. Small gangs are organized in each county, equipped for the special work required, according to the type of road to be maintained; a gang for applying surface treatments; one for heavy blade grader work; one for scarifying and shaping up old gravel and macadam roads; one for resurfacing, etc.

Work of this nature should begin as early each season as weather conditions will permit.

In many of the counties that have a large mileage of state trunk highways, and especially in those that have a county trunk system in addition to the state trunk and have in their employ from 10 to 45 patrolmen, the Commssion believes that these counties should employ the services of a maintenance superintendent unless they have an assistant highway commissioner who can attend to this work.

With an average of probably 30 patrolmen in many of the counties, it will require the entire time of a good man to supervise the work being done by the patrolmen. The maintenance superintendent can be paid out of the state trunk highway funds and out of the county trunk highway funds, according to the time put in on each.

"Ideal Section" of Lincoln Highway Will Be Built of Concrete

The Lincoln Highway Association has announced that the "Ideal Section" of highway which it is planning to construct next year, will be paved with concrete.

Although the questionnaires sent out by the association did not ask for suggestions relative to the nature of paving material for the section, 40 engineers indicated in their responses the nature of pavement to be employed, as follows: Concrete, 15, reinforced concrete, 9; asphaltic concrete and concrete (for differing lanes) 3; sheet asphalt on concrete, 3; brick or concrete, 3. One engineer's specifications called for brick on concrete; one called for bitulithic on the truck travel lane and concrete for the passenger car lane; one called for a similar arrangement, using concrete and gravel; one suggested gravel only; one macadam; one dirt and one "sheet steel."

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*rom "Highway Maintenance," Bulletin No. 11 of the Wissin Highway Commission.

Lincoln Highway Association Announces Technical Committee

Committee Will Determine Specifications For "Ideal Section" of National Highway

The Lincoln Highway Association has announced the appointment of a technical committee to determine the specifications for the "Ideal Section" of the Lincoln Highway, which is to be constructed next year at some point upon the transcontinental road. The plan followed by the Board of Directors of the Lincoln Highway Association in appointing the "Ideal Section" Technical Committee was to have represented in the deliberations of the committee, every class interested in the development of American highways. The personnel of the committee is as follows:

Thomas H. MacDonald, Chief, Bureau of Public Roads, U. S. Department of Agriculture, Washington, D. C.; A. R. Taylor, State Highway Commissioner of Ohio; Col. J. M. Ritchie, Motor Transport Corps, U. S. A.; F. R. White, State Highway Engineer of Iowa; A. R. Hirst, State Highway Engineer of Wisconsin; W. G. Thompson, formerly State Highway Engineer of New Jersey; Col. W. D. Uhler, State Highway Engineer, Pennsylvania State Highway Department; Edward N. Hines, Chairman, Wayne County, Mich., Highway Commission; T. R. Agg. Professor of Highway Engineering, Iowa State College; Clifford Older, State Highway Engineer, Illinois State Highway Department; Arthur H. Blanchard, Professor of Highway Engineering and Highway Transport, University of Michigan; Col. Sidney D. Waldon, Director, Lincoln Highway Association.

There still remains to be appointed a landscape architect who will consult with the highway engineers in connection with the plans developed, which are expected to include a practical application of highway beautfiication in the way of planting along the roadside.

New Jersey Senate Committee on Highways Holds Hearing on Proposed Motor Fees

Bill for Increased License Fees Held Until Traffic Commission Files Report

The New Jersey Senate Committee on Highways held a public hearing on Sept. 8 on the proposed bill to increase license fees for motor vehicles according to gross weight and carrying capacity. Under the provisions of the bill, which was passed by both the Senate and House of Assembly, but reconsidered by the Senate, the proposed increases for motor vehicle registrations would become effective the first of next year. The measure provides that vehicles of a carrying capacity of 1,000 lb. or less shall pay an annual license fee of $7.50. The bill also provides for a graded scale of fees for motor trucks, with a maximum fee of $80.40 for trucks of 30,000 lb.

When the Senate reconsidered its favorable vote it was done with the understanding that legislation on the subject of higher motor fees would be withheld pending the investigation and report of the special Traffic Commission, which is engaged in making a survey of traffic regulations and will make recommendations for the fixing of future motor vehicle fees. The State Highway Commission takes the position that the Legislature should give serious consideration to the bill as a temporary expedient to raise additional funds for highway purposes.

Tests for the Permeability of Concrete

Some preliminary tests have been made by the U. S. Bureau of Standards of a new apparatus for determining the rate of penetration of water through concrete and other permeable material. Since the problem of the action of water on the surface and subgrade of our highways is now holding the attention of roadbuilders in this country, the results of these investigations will be of interest.

The apparatus used in conducting these tests is so constructed that it is not necessary to mold the test piece in any particular shape, but any slab having one fairly smooth face may be tested. Only a few minutes are required for placing and adjusting the test specimen. This will permit specimens to be cut from roads or walls for tests. While the tests so far made have been more in the nature of a tryout for the apparatus, some interesting results have been obtained.

In the following table the results of tests on samples of stones from various quarries, as well as some mortar and concrete specimens, are shown. The specimens varied from 1¼ to 2½ in. in thickness and pressure was applied over an area of 25 sq. in.

Test Specimen	Absorption in 24 hours (per cent.)	Thickness (inches)	Water Pressure (pounds)	Time required for penetration through wall (minutes)
Limestone	5.80	1⅝	60	10½
"	3.10	1 5/16	"	11
"	4.40	1⅝	"	19
"	4.60	1⅝	"	2 2/3
"	3.81	1⅝	"	1/3
"	3.48	1¼	"	1½
Sandstone	5.56	2½	"	10 sec.
1:6 Portland cement mortar	7.8	2	"	3½ hrs.
1:1½:2 concrete	5.8	2	"	

The sample of concrete did not fail in 24 hours and when broken the water had penetrated only ½ in.

These results appear to bear out conclusions previously drawn in the Bureau's investigation of the durability of concrete in alkali soils that there is no apparent relation between absorption and permeability.

While considerable work must be done to standardize the method of making the permeability tests, it appears that this apparatus will assist in studying with a minimum of effort an important characteristic of concretes which in the past has been generally ignored, due to lack of suitable apparatus.

New Hampshire Goods Roads Association

OFFICERS FOR 1920

WINFRED M. CHAPLIN, President	Keene
WM J MORRISON, Secretary and Treasurer	Keene
HARRY L. SMITH, First Vice President	Lakeport
OZMAN W. FERNALD, Second Vice President	Berlin

Board of Directors

WILLIAM A. GROVER	Dover
H. W. SPAULDING	Manchester

The regular quarterly meeting of the New Hampshire Good Roads Association was held at Portsmouth, Thursday, Sept. 9. The business meeting of the association was held at the City Hall in the Aldermanic Chambers. The meeting was called to order at 12 o'clock by President Winfield N. Chaplin. There were about fifty members present.

Three applications were received and acted upon favorably.

The question of different kinds of materials used for modified Topeka pavement was discussed among the members. Ex-President Winslow; Mr. Grove; F. E. Everett, State Highway Commissioner, Mr. Purington, State Chemist, and Assistant Highway Commissioner Fred C. Coburn were the members who took part in the discussion.

Ex-President Winslow informed the members that each and everyone should make it a point to impress upon their representatives and senators the necessity of getting larger appropriations for highway work throughout the State of New Hampshire for the coming year.

Mr. Winslow spoke at length on the difference in price of materials and labor this past year in comparison with conditions of three or four years ago.

Assistant State Highway Commissioner Fred C. Coburn said that the same appropriation as five years ago will produce aproximately 45 to 50 % of the number of miles of highway under present conditions. In some cases materials have increased from 200 to 300%, whereas the revenue from automobile registration fees has increased only 20%.

The cost of maintenance in comparison with the amount of money received from automobile registrations is very large, and for that reason something must be done to take care of the increased traffic, especially on the main trunk lines. For example, in 1918 in 10 hours at a point in Portsmouth 4,800 vehicles passed and at the same point this year 8,300 machines passed in 8 hours.

The question of using local field stone in place of trap rock was also taken up. State Chemist Purrington informed the members that for new work, local stone construction, using bituminous binders, would be cheaper in the long run. It would be cheaper than using trap rock or any other stone that must be shipped in from Massachusetts.

Mayor Hyslop, of Portsmouth, delivered a very fine address of welcome to the members, during which he mentioned the fact that he was a firm believer in permanent pavements. He also believes in a municipality having efficient equipment to carry on its work, such as trucks, loading machines, mixers, rollers, etc.

A motion was made and seconded to have a committee appointed by the president to designate where the annual meeting of the association would be held. President Chaplin appointed on this committee, Mr. Smith, Ex-Mayor Crowley of Nashua and Mr. Fields.

The business meeting adjourned at 1:45 p. m. for luncheon at the Hotel Rockingham. The luncheon was one of the finest that the association has had for some time and too much credit cannot be given to Mayor Hyslop and Mr. Grover who made up the committee of arrangements.

Speaking at the luncheon was very limited and a few remarks by Mayor Hyslop and State Commissioner Everett constituted the speech making program. After luncheon the members visited the asphalt plant of Mr. C. A. Badger, which was very instructive and very educational to many of the members. After the visit the members returned to Portsmouth, making a tour of the different sections of the city inspecting the different types of pavements.

President Chaplin informed the members that he had forwarded to "Good Roads" a check covering the subscription renewal to the magazine. If any of the members in good standing are not receiving this monthly magazine they are requested to communicate with Secretary Wm. E. Morrison, of Keene, N. H.

At 6 o'clock the meeting adjourned and several of the members journeyed in autos to Hampton Beach, N. H., where a very interesting carnival was being held, at which many of the State of New Hampshire representatives were present, including Governor Bartlett and his staff.

There was a strenuous labor meeting held in Manchester on Labor Day. There was a parade, with speeches afterward. The principal text taken by the speakers seemed to be the declaration made by Philip J. Byrne who came on from Washington evidently with a mission to perform. He is quoted as saying that labor would not surrender its "inalienable right to strike no matter what legislation is put upon the statute books."

In closing his address the speaker remarked for the benefit of the policemen at the back of the hall that if they "would come to the American Federation of Labor they would help to have their pay raised."

There are parts of New England in which the affiliation of policemen, firemen and other workers with labor unions is not considered a pleasant topic for conversation by the general public.

The City of Keene, is reconstructing Main St., from the railroad crossing to Monument Square. The pavement is to be of tar penetration.

Old residents of Manchester find it hard to reconcile themselves to the appearance of Amoskeag Falls with the last vestige of the old bridge gone, but from every angle the change is one of the outstanding improvements of the year in Manchester. There is no doubt in the minds of those in a position to know that the collapse of the woden shell which was such a disfigurement to picturesque Amoskeag Falls was due to the water soaked condition of the timbers supporting the bridge. When the roof of the bridge was removed the wood work was exposed to the weather and excessive rains finally accomplished their purpose.

The City of Nashua has recently completed the concrete bridge just above the Massachusetts state line, which has been closed to heavy traffic since July 1.

The City of Portsmouth has just let a contract to the C. A. Badger Co. to lay 20,000 sq. yd. of sheet asphalt on city streets, the work to begin at once.

Portsmouth has applied during the past season some 30,000 gal. of road oil and tar and recently the Sagamore Bridge has been repaired and replalnked at a cost of $3,000.

New York State Road Builders' Association

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C. J. HENDRICKSON, Vice President	Syracuse
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RICHARD HOPKINS, Chairman	Troy
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W. A. GREENFIELD	Hornell
C. J. HENDRICKSON	Syracuse
J. F. PADDELFORD	Sherburne

Crusher Run

A change is to be made in the present bridge by which the state highway is carried over the West Shore Railroad tracks, north of Malone on Hudson. The Public Service Commission of the second district, has directed the erection of a steel plate girder bridge with masonry abutments and pier, the main span to be 106 ft. in length and approach spans 35 ft. The bridge roadway is to be paved with brick, and the approaches with bituminous macadam.

The many friends of Harry A. McLaughlin will be pained to hear of his recent death; and the number of friends he possessed is beyond count. He was a favorite with all road contractors and his genial presence was always welcomed at the rooms of the Road Builders' Association. Mr. McLaughlin was in charge of the New York office of the Thew Automatic Shovel Co. This company is an associate member of the New York State Road Builders' Association. Mr. McLaughlin's body was taken to Saginaw, Mich., for burial.

Commissioner Frederick Stuart Greene will not allow any delay on contracts until next spring, because of alleged shortage of labor and difficulty in securing material. Contractors must start work on their contracts, or the contracts will be cancelled and readvertised.

The Public Service Commission, in order under Case No. 7714, dated at Albany, N. Y., Aug. 24, 1920, has granted the request of the State Commission of Highways, and suspended the proposed increase in rates until Oct. 15, 1920. Contractors should, therefore, not pay any rate in excess of those which they have been paying prior to Aug. 24, 1920.

There are six roads advertised for completion in the letting to take place on Tuesday, Sept. 28. The following notice appears at the bottom of the advertisement:

Before contracts for any of the improvements advertised above are awarded the successful bidder will be required to furnish evidence that he can secure deliveries of all necessary materials and that he can progress and finish the contract promptly.

At the hearing which was recently held before the Public Service Commission relative to the increased freight rates in interstate traffic, F. W. Brown, Attorney for the State Commission of Highways, was present and asked that rates affecting highway improvement be postponed, because of the failure of the railroads to make deliveries to road contractors. Objection was also filed by W. L. Sporborg, speaking for the crushed stone interests of the state.

Massachusetts Highway Association

OFFICERS FOR 1920

JAMES C. BLAKE, President	Worcester
JOHN M. McCARTHY, Secretary	Natick
CHARLES A. BROWN, Treasurer	Wellesley

VICE PRESIDENTS

HENRY V. MACKSEY	Woburn
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Directors

JOHN A. GAFFEY	Medford
HENRY A. SPATES	Gloucester
WILLIAM P. HAMMERSLEY,	Norwood
FRED B. RICHARDSON	Brookline

Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

John D. Devir, Superintendent of Streets of Malden, is just back from a two weeks' cruise along Atlantic Coast from Hampton Roads to Boothbay Harbor, Me., in his quick-moving power boat, the Patsy Gee. While most of Jack's efforts are daily confined to terra firma, when it comes to vacationing, give him the good old briny deep.

If all of the 3,851,651 men, women and children who live in Massachusetts, according to the new census figures announced recently, had to be moved a distance of 50 mi. in a single day, this enormous task could be accomplished by the motor vehicles that are owned in the state. There are enough motor cars, trucks and motorcycles registered so that if each of them were to make three trips of 50 mi. each in a day they could carry the entire population.

Up to the first of this month there had been registered 304,282 cars, trucks and motorcycles. Allowing each a capacity of four persons they could carry at one time more than 1,200,000 persons and with a little overloading of the nearly 50,000 trucks could take the entire population in three trips.

The registration figures show that on Sept. 1, there were registered in Massachusetts 231,637 passenger cars, 48,648 trucks, 14,162 motorcycles and 1,967 dealers, each dealer registration carrying with it the right to five sets of number plates. That the numbers issued, which are in the vicinity of 206,000 for passenger cars, are not as large as the number of cars registered is accounted for by the fact that one person may use the same plate for more than one car that he owns in the course of a year.

The license statistics show that if the entire population were to be taken out riding there would be plenty of drivers, for there are about 307,000 persons including motorcycle drivers, licensed to operate motor vehicles, which would provide a driver for each vehicle, with a few left over.

That the state is engaged in a profitable business in registering motor vehicles and licensing drivers appears from the fact that up to the first of this month the receipts from these sources amounted to $3,556,405. All this money, with the exception of what is necessary to pay the expenses of the motor vehicle registry, goes into road maintenance.

The registration of cars and trucks, it is believed, will run very close to 300,000 before the end of the year. For the period up to Sept. 1 the increase in car registration was at the rate of 25% over last year. In the case of trucks the increase was at the rate of about 22%. The comparative figures for last year and this, up to Aug. 31 inclusive, are as follows:

	1919	1920
*Automobiles	224,538	280,285
Motorcycles	12,403	14,162
Manufacturers or dealers	2,320	1,967
Licenses (op. and chauf.)	61,851	85,210
Renewals (op. and chauf.)	177,035	207,577
Examinations	14,101	31,865
Total receipts	$2,151,922	$3,556,405

*Including 39,969 commercial vehicles in 1919 and 48,648 in 1920.

New England will receive $3,108,405.98 for federal aid road building under the final apportionment of available funds made public by the Department of Agriculture. Massachusetts obtained the largest allotment, with a total of $1,104,591.62. The other New England apportionments were: Maine, $720,172.62; New Hampshire, $311.129.20; Vermont, $337,557.82; Connecticut, $460,012.07; Rhode Island, $174,942.65.

Under the law each of the New England States must enter into formal agreements with the Secretary of Agriculture before July 1, 1922 for the construction upon which this money is to be used. This means that the New England States must survey, plan and let contracts for $3,108,405.98 worth of federal aid roads within the next two years unless Congress acts during the coming session to continue appropriations. The entire national program of road building authorized in 1915 will suffer a serious setback according to Thomas H. MacDonald, head of the Bureau of Public Roads of the Department of Agriculture.

On July 1, 1920 the final apportionment of available funds was made. This comprised a total of $100,000,000 allotted to the states in proportion to their population, area and mileage of post roads, and with the further proviso that the respective states appropriate equivalent amounts for road construction. If the states continue to pay more than 50% of the cost, as they have in the past, the cost of roads constructed with this last appropriation may reach $250,000,000. Chief MacDonald of the Bureau of Public Roads states that it will be necessary to plan for construction at the rate of at least $100,000,000 and probably more. Highway departments should know at least a year in advance what funds are to be available in order that plans may be made for future construction. Unless, therefore, further fedarel action is taken in the coming year, the states will be left in doubt as to the future policy of the Government and the amount of money they must be prepared to expend.

Such a contingency would involve a serious setback to the progress of road construction and should be avoided by early congressional action. It is considered probable that, before Congress votes additional apropriations for federal aid roads, a comprehensive investigation of the work accomplished with the funds already made available will be instituted. Reports of waste and graft have reached the Capitol in connection with the expenditure of some of the federal funds. Whether these reports originated in the minds of disappointed contractors, as has been alleged, or whether they have a real foundation, Congress will insist on knowing.

The 1920 tax rate for Melrose is $29.50, an increase of $3.30 over last year. City, county and state assessments are all up, the total tax levy being $686,467.43, a rise of $96,682.47. The city expenses are $81,204.79 greater than last year, of which the schools take $72,600. Real estate is now valued at $18,878,800, a growth of $626,725, and personal property is appraised at $2,206,600, or $255,100 more than last year. The total valuation is $21,085,400. Polls are estimated at $18,220, four less than the count by census enumerators.

Motor Vehicles Registrar Frank A. Goodwin states that during July there was an increase of 920 in the number of persons injured by automobiles, as compared with July of last year. Fifty-eight persons were killed. Too much speed for traffic conditions is the chief cause. As a result of the great increase in the number of motor vehicles without a corresponding increase in the number of roadways, it seems necessary to impress upon the operators of motor vehicles that there must be a general slowing down. In the month of July, 2,419 persons were injured in this state.

Randolph, with a $36 tax rate, is high line so far, although Concord, with a rate of $35.60, is not far behind.

The Journey From Boston to New York By Land in 1788

(Concluded)

Before arriving at Middleton, where we were to breakfast, we stopped on the hill which overlooks that town and the immense valley on which it is built. It is one of the finest and richest prospects that I have seen in America. I could not satiate myself with the variety of the scenes which this landscape laid before me.

Middleton is built like Hartford—broad streets, trees on the sides, and handsome houses. We changed horses and carriages at Durham; and after admiring a number of picturesque situations on the road, we arrived at Newhaven, where we dined. The university here enjoys a great reputation through the continent; the part is much frequented; the society is said to be very agreeablle.

We were obliged to quit this charming town, to arrive in the evening at Fairfield. We passed the inconvenient ferry at Stratford; afterwards, assailed by a violent storm, we were well enough defended from it by a double curtain of leather which covered the carriage. The driver, though pierced through with the rain, continued his route through the obscurity of a very dark night. Heaven preserved us from accident, at which I was much astonished. We passed the night at Fairfield, a town unhappily celebrated in the last war. It experienced all the rage of the English, who burnt it. You perceive still the vestiges of this infernal fury. Most of the houses are rebuilt; but those who have seen this town before the war, regret its ancient state, and the air of ease, and even opulence, that then distinguished it. At Fairfield finished the agreeable part of our journey. From this town to Rye, thirty-three miles, we had to struggle against rocks and precipices. I knew not which to admire most in the driver, his intrepidity or dexterity. I cannot conceive how he avoided twenty times dashing the carriage to pieces, and how his horses could retain themselves in descending the stair-cases of rocks. One of these is called Horseneck; a chain of rocks so steep, that if any horse should slip, the carriage must be thrown into a valley two or three hundred feet.

From Horseneck we passed to New Rochelle, a colony founded the last century by some French emigrants, which appears not to have prospered. Perhaps this appearance results from the last war; for this place suffered much from the neighborhood of the English, whose headquarters were at New York.

It is thirty-one miles from Rye to New York. The road is good, even and gravelly. We stopped at one of the best taverns I have seen in America. It is kept by Mrs. Haviland. We had an excellent dinner, and cheap. To other circumstances very agreeable, which gave us good cheer at this house, the air of the mistress was infinitely graceful and obliging; and

(Continued on Page 152)

MEETINGS

Calendar of Coming Meetings

Oct. 6-8.—League of Kansas Municipalities.—Annual convention, McPherson, Kan. Secretary, Albert A. Long, University of Kansas, Lawrence, Kan.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Nov. 8-12.—League of California Municipalities.—Annual convention, Chico, Cal. Executive secretary. W. J. Locke, Pacific Bldg., San Francisco, Cal.

Nov. 15-17.—City Managers' Association.—Annual convention, Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York, N. Y.

New Jersey State Association of County Engineers.

Standard specifications for road work under state aid were discussed at a special meeting of the New Jersey State Association of County Engineers on Sept. 3, at which time the committee on specifications made its report . State Highway Engineer Wasser was present at the meeting. The modifications and suggestions adopted by the association will be submitted to the State Highway Department.

The committee on specifications consists of A. H. Nelson, of Atlantic County, William C. Catell, of Gloucester, and George D. Cooper, of Monmouth.

PERSONAL MENTION

John T. Edwards was recently appointed supervisor of maintenance in the New Jersey State Highway Department.

A. W. Hardy has been appointed resident engineer in charge of the bridge now under construction between Minco and Union City, Okla.

J. C. Davis, formerly with the University of Oklahoma, has been appointed testing engineer for the Oklahoma State Highway Department.

Charles D. Snead, Senior Highway Bridge Engineer, U. S. Bureau of Public Roads, has succeeded J. L. Parker of the Montgomery, Ala., district.

R. M. Gates, Engineer in the New York office of the Lakewood Engineering Co., has been appointed managing engineer of the Philadelphia district.

O. W. Whitecraver, Assistant Engineer of Georgetown, S. C., for 20 years, has been appointed assistant engineer with the Charleston, S. C., office of the U. S. Bureau of Public Roads.

J. L. Parker, formerly Senior Highway Engineer in the Montgomery, Ala., district of the U. S. Bureau of Public Roads, is now special bridge engineer with the South Carolina State Highway Commission.

James P. Allen, formerly Assistant Engineer in the Charleston, S. C., office of the U. S. Bureau of Public Roads, has engaged with W. S. Fitzsimons, also assistant engineer of the same office, in private engineering practice.

P. C. Painter has been appointed city engineer of Washington, N. C., and will take charge of the extensive improvements which will be started in that city next year. Mr. Painter was formerly assistant engineer of the Paving Commission of Baltimore, Md.

The Journey From Boston to New York By Land in 1788

(Continued from Page 151)

she had a charming daughter, genteel and well educated, who played very well the forte-piano. Before arriving at New York, we passed by those places which the English had so well fortified while they were masters of them. You still see their different redoubts and fortifications, which attest to the eye of the observer the folly of this fratricidious war.

More than 30 cities and towns of eastern Massachusetts have announced their new rates, the average of which is about $27. This is an increase of $3.37 over last year and is up some 50% from the average of the years immediately preceeding the war.

That the increases have been generally necessary seems beyond question. The town and city budgets have felt the full brunt of the increased cost of living in much the same way as has the individual. Furthermore, a tremendous amount of repairs and new construction that is normally done each year was put off during the war years, and was again deferred in considerable measure last year because of the further advance in prices, cannot now be longer deferred even though prices and costs are still inordinately high. As a result of this piling up of civic work, larger levies from the public purse have become inevitable.

It is unfortunate that these increased taxes fall mainly upon real estate and thus further increase costs in this field just at a time when every encouragement to building is necessary to meet the intense demand for homes. Indeed, the situation in this respect has come to such a pass that here and in other parts of the country plans for the inauguration of municipal income taxes are being seriously considered.

While we are not prepared to advocate such a tax, it can be seen that it at least would have the merit of making every person directly interested in city finances.

1920 – 8

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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*Illustrated article

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Waterbound macadam road looking north from village of Saugatuck, Michigan, treated with "Tarvia-B" in 1917, 1918 and 1919.

West Michigan Pike, near village of Douglas, Mich. Waterbound macadam treated with "Tarvia-B" in 1917, 1918 and 1919.

In oval: Waterbound macadam road near South Haven, Mich., patched with "Tarvia-KP" and treated with "Tarvia-B" 1918, 1919.

West Michigan Pike, Van Buren County, Michigan. Waterbound macadam roadway treated with "Tarvia-B" in 1918 and 1919. Part of a 15 mile stretch of Tarviated roadway.

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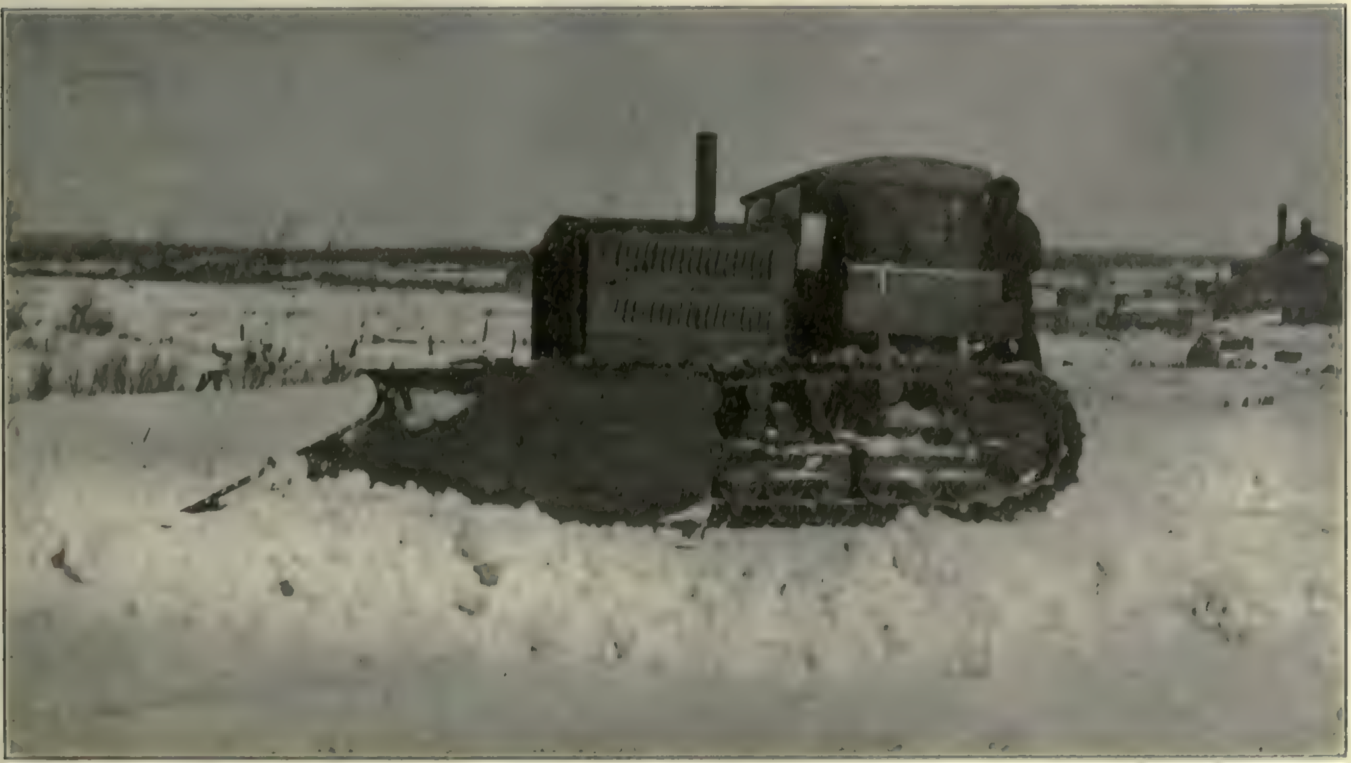
JAMESTOWN, N. Y., SEPTEMBER 29, 1920
Number 13

Removing Snow from the Highways

Prior to the period of the Great War during which the motor truck grew to be a vital factor in the transportation system of this country, the removal of snow from municipal streets and country highways was not generally carried on with any great vigor or method. The problem of snow removal is one which does not confront the highway official continuously; hence easily forgotten when the sun is high in the skies.

In New York City last winter, vehicular traffic was paralyzed for twelve days, causing an economic business loss estimated at $60,000,000, although over $5,000,000 was expended by the city for snow removal. The fall of snow last year was unusually heavy and throughout the northern United States the lines of communication were snowbound for considerable periods. However, because of lack of adequate equipment on the part of both municipalities and rural communities, snow conditions were often worse than need have been. But the blizzards of last winter very forcibly have emphasized the problem of snow removal and many cities and counties have begun active preparations to provide for future emergencies. The City of New York is planning to spend between $4,000,000 and $5,000,000 for adequate snow removal equipment, exclusive of labor, to be placed in service during the coming winter.

Most of the state highway departments in the snow belt are not empowered to carry on the work



CLEARING SNOW FROM A COUNTRY ROAD WITH A SNOWPLOW ATTACHED TO A HOLT "CATERPILLAR" TRACTOR

SNOW REMOVAL IN INDIANAPOLIS, IND.—ADAMS LEANING WHEEL GRADER DRAWN BY WORK CAR

of snow removal. But the movement for year-round highways is rapidly growing and it is probable that within a few years, legislation will be passed in all the northern states to provide for the carrying on of this work which is now largely carried on by the counties. Business organizations, automobile clubs and all interested in motor transportation are agitating the movement for 365-day highways, calling attention to the fact that snow removal is an essential part of a complete good roads program.

There is but slight possibility that railroads can increase their transportation facilities sufficiently to meet all needs for all forms of transportation for several years. In consequence the necessity for keeping the highways open for motor traffic is apparent. Last year, because of heavy falls of snow and entirely inadequate preparation to cope with snow exigencies, enormous economic loss was suffered throughout the northern part of the country. Recurrence of snows such as blocked the roads for weeks and even months last winter will cause a critical condition in the entire business world unless steps are taken to keep the highways open. With the many millions of dollars invested in motor cars and trucks and many other millions invested in roads, it is a great loss to allow the highways to remain unused many weeks in the year because of snow. The cost of snow removal is small when compared with the benefits that will accrue from having open highways.

OPENING SIDEWALK WITH HORSE-DRAWN PLOW OF THE OWENSBORO DITCHER LINE

Snow removal is essentially emergency work and should be planned as such; the snow should be gotten out of the way in the shortest possible time at the lowest practicable cost. Plans should be formulated during the summer months and equipment necessary to carry out these plans should be purchased. Operations should be started while the snow is falling; many snow-storms have needlessly blocked traffic because of delay in commencing snow removal work. In the planning of the work, one may well pattern it after plans for emergncy work in military tactics. The snow may be regarded as the common enemy. Men are assigned to definite posts and when the signal is given start work in cooperation with other men at other points. The plan of action should be to keep the traffic moving. This means that the snow should first be removed from the path of traffic and then be taken off the highway so as not to accumulate on the wayside.

CLEARING A PAVED ROAD LEADING OUT OF LINCOLN, NEB., WITH A "HIGHWAY MAINTAINER" DRAWN BY A MOTOR TRUCK

Until about ten years ago the work of snow removal was not commenced until after the storm had subsided. However, with the increased number of passenger automobiles and motor trucks, this method failed to meet the demands of a greatly changed traffic. Accordingly, since 1918, considerable thought has been given toward the improvement of the organization, equipment and methods of snow removal. In 1914, a snow removal conference was held in Philadelphia, Pa., with representatives from sixteen large eastern cities in attendance. The committee on resolutions of this conference recommended that the plan of organization and methods to be used should be made in advance of the snow season; the work should start when the snow had covered the pavements and should be carried on continuously; the sewer system should be utilized to capacity to rid the streets of snow; the work should be done by day labor; cooperation of the traction companies should be sought and the roadways alongside the tracks should be cleared by adjustable plows and sweepers at the same time the tracks were being cleared; property owners should be instructed to cooperate with the work by piling the snow from the sidewalks on the sidewalks near the curb, instead of throwing it into the street which had already been cleared; the police force should cooperate in the work as far as possible. The committee on resolutions recommended the formulation of a skeleton organization of all the available city forces and the division of the city into zones and the assignment of officials to specific posts.

TWO METHODS OF SNOW REMOVAL ON A WISCONSIN ROAD—TEAM AND GRADER AND TRUCK WITH ATTACHED PLOW

In the removal of snow on country highways, the men employed on maintenance work in the summer should be used in keeping the highways open for traffic in the winter. The highway patrolmen of Nebraska are now maintaining the highways of that state both in summer and winter. Because of the increasing interurban motor hauling, the problem of snow removal on the main highways grows more important each year, many cities now being dependent on motor transportation for a large part of their supply of foodstuffs. It will not be many years before the keeping of the main country roads open to traffic in the winter will come to be considered equally as important as the repairing of the pavements themselves. Accordingly it grows more apparent that snow removal is properly a maintenance function of state highway departments. At the present time however, there are but few states which have enacted legislation providing for the maintenance of main trunk highways during the winter, although such legislation may be expected to be passed in many of the northern states because of the activities of motor and allied interests in this matter. The work of snow removal is being carried on for the most part by counties in the various states.

REMOVING SNOW BY MEANS OF A WIDE SNOWPLOW DRAWN BY A HOLT TRACTOR

In Milwaukee County, Wisconsin, for example, the work of snow removal on its system of trunk line

CLEARING A STREET IN BROOKLYN, N. Y., WITH A "CHAMPION" PLOW ON A MACK TRUCK highways is very efficient and as a result the county's main highways are traversable throughout the winter. The county takes care of about one-half of 175 mi. of improved highways and the townships care for the remainder. A snow removal fund has been created and is taken from the general tax funds.

The county is divided into four districts each supervised by a foreman. The snow removal work is done by the district maintenance crews and is paid for from the snow removal fund. Last winter, six motor trucks equipped with plows were operated almost exclusively in snow removal work. These trucks were assigned as nearly as possible to definite districts, but often snow in one district was greater than that in other districts and the trucks were used so as to produce the most efficient results. With snow to the depth of 12 to 18 in., the trucks operated very successfully and one truck in a storm last winter cleared an 18-ft. strip of roadway in one round trip. One of the accompanying illustrations shows a motor truck and plow clearing the highway in Milwaukee County and a horse-drawn scraper clearing the shoulders.

During 1920 the county spent $4,700 on snow removal, or an average of $60 per mile. A large part of this cost was caused by the almost continual high winds which kept piling the snow in heavy drifts, necessitating recourse to hand shoveling. During snowstorms, crews were often kept at work night and day removing the snow as fast as it had fallen.

Because of its efficient methods of coping with the problem of snow removal, Milwaukee County highways are open to vehicular traffic throughout the year. Farm products, including milk, are brought to the City of Milwaukee over its highways throughout the winter. That it is important that the highways should be open to this traffic during the winter is seen in the fact that 65% of the milk and dairy products consumed by the City of Milwaukee enter the city by means of motor trucks. The County Loop, the county's pleasure thoroughfare is also kept open.

Lancaster County, Nebraska, in which is situated Lincoln, the capital of the state, has about 250 mi. of highways which are kept open to motor traffic throughout the year. The work is done with the regular maintenance forces of the county and three army trucks, each of which pulls a highway maintainer, as shown in one of the accompanying illustrations. An average speed of 5½ mi. per hour in attained and a width of 24 ft. is cleared from snow which has ranged from 12 to 20 in. deep. The cost of clearing 1 mi. has been found to average about 70 ct. During the last winter, when train service was paralyzed, highways leading into Lincoln were kept open for vehicular traffic.

The officials of Lancaster County plan to use the county road maintenance crews to remove light snows with highway maintainers and heavy snows with "V" plows made of bridge planking. These plows are made of 3x12-in. planks, 16 ft. long with a spread of 12 ft. at the end of the wings. The wings consist of two planks on edge, making a 2-ft. face.

Many states are now considering carefully the work of snow removal as a part of highway maintenance. The State Highway Departments of Pennsylvania and Connecticut have been active for the past few years in maintaining the highways in their respective states during the winter months and many other state highway departments are seeking legislation to empower them to carry on the work of snow removal. In 1918, Connecticut spent $40,000 for snow removal on a total of 970 mi. of highways or about $45 per mile. During the same year, the State of Pennsylvania spent from $50 to $200 per mile on certain highways, depending upon the location and other conditions.

The State of Nebraska recently organized a patrol maintenance system which will take care of 3,000 of the total 4,500 mi. of highways in that state. Last winter plans for snow removal were not entirely complete but it is expected that the work will be carried on actively by the patrolmen in the future. Blade graders pulled by motor trucks were used to a large extent last season and it is planned to use in the coming winter, drags pulled by trucks or teams. Reports for the first division of the State Highway Department show for the month of April, the first month which the patrol maintenance system was put into operation, a total expenditure of $2,344.25 for snow removal.

During the war, many army motor convoys were sent in the years 1917 and 1918 over many highways in the country. These convoys were engaged in transporting commodities used in the production of munitions and other war necessities. As a result great impetus was given to the work of snow removal, many states instituting a detailed organization for carrying on this work, noteworthy among them being Pennsylvania. This state has approximately 10,000 mi. of highways of which 65% are unimproved. The Division of Maintenance of the State Highway Department, composed of assistant engineers, superintendents, foremen, caretakers, laborers, etc., took complete charge of the snow removal work under the direct supervision of the Second Deputy Commissioner. Although this division had its inception in 1913, the work of snow removal had not been carried on with any great vigor until 1917. Because of war conditions a new class of traffic had to be reckoned with. Arrangements were made with the United States Weather Bureau officials to wire forecasts of approaching storms to the central office at Harrisburg where information was communicated mobilization of the snow forces, thus enabling the mobilization of the snow cleaning forces and the preparations in commencing the fight when the snow began to fall. Also the War Department submitted

(Concluded on Page 160)

Beautifying Our Roadsides*

By C. F. BOEHLER†

In a study of our present-day road problems, we can determine approximately how much per mile a gravel road will cost, or a macadam road, or a concrete, asphalt or brick pavement.

Likewise, by determining the traffic conditions, we can estimate aproximately how much per mile per year it will cost to maintain a gravel road or a macadam road or any one of the ordinary hard-surface pavements.

Or we might figure that under given traffic conditions, we can estimate approximately how per mile per year it will cost to maintain a gravel road or a macadam road or any one of the ordinary hard-surface pavements.

Or we might figure that under a given traffic condition a concrete pavement, for example, would wear so much per year and that on such a basis it would last so many years. By simple arithmetic then we could calculate the cost of the road for each vehicle that passes over it. The present-day tendency is to think in terms of dollars and cents, and, as our roads are costing in the aggregate a vast amount of money, it is important that we should study carefully all the statistics at hand so that we not only get the most serviceable roads, but also the most economical roads.

What would it cost to beautify our roads? Would it cost $100 per mile or would it cost $10,000?

Let us consider for a moment that perhaps road construction is not unlike other construction in the sense that it is a gradual development, an evolution based on experience and example. In architecture we see this evolution. While this is a very old profession, we can see its development exemplified in any city or village. The old type houses are giving way to more attractive ones—thoroughly practical, but with an artistic touch. The old type railway stations are being replaced with well designed structures. Libraries, post office buildings and public buildings in general are required by public opinion to be made attractive as well as useful. Even in the case of office buildings and banks we find that an artistic arrangement is one of the requirements. Here, if anywhere, we would expect that beauty would be sacrificed if it were costly and not good business. The point that I wish to emphasize is first that beauty of design is not necessarily costly and is good business. Consciously or unconsciously the mass of people want attractive surroundings and hard-headed business men realize this and provide for it to their advantage. Secondly, there is no conflict between artistic design and practicability, indeed the two go hand in hand, for practicability is one of the essentials of good design.

But what has all of this to do with roads? Simply to show that it is inevitable that our roads must be made attractive. As architecture of homes, of public buildings, of commercial buildings has developed along the lines of practicability plus beauty, so must the engineering of our roads develop, for the people will more and more demand not only to travel over the roads, but to travel over attractive roads.

And I wish to state that there is no conflict between the attractive and the practical road. It is not necessary to have all of our roads lined with flower gardens and rose beds, but each road should be a study in itself to determine what is the best and most practical means of beautifying. As in buildings, so in roads, beauty and practicability must go hand in hand.

The State of Michigan has wonderful natural beauty in its myriad lakes and streams, its pleasantly rolling lands in the southern part and, in the northern part, its more rugged hills once densely wooded with pine and hemlock or with hardwood timber.

Through a wasteful and unfortunate system of lumbering a large part of the timber has been cut off and the aftermath of repeated burnings has reduced large areas to unproductive barrens. It will take many years to undo the harm that the fires have done to our potential forest resources and to restore the beauty that has been destroyed. We advertise Michigan as the "Playground of the Middle West" and well we may, for we have the potential resources of a vast playground. We already attract tourists from many states and it is safe to assume that in future years the summer tourist traffic will be greatly increased. We must make our roads attractive to our visitors, for we cannot hope to attract people year after year to a region with the tree growth destroyed, with fires yearly burning off all the young trees and even the humus from the soil. Through our barren lands along our highways we must first control the forest fires, then we must plant and protect trees to take the place, at least in part, of the magnificent forests that a few years ago grew there.

How shall we go about it to make our roadsides attractive? In the first place, let us not lose sight of the fact that we already have many beautiful highways. While we have been busy clearing out roadways, cutting down timber and cleaning up brush, nature has been busy and by means of the birds, animals and winds has done such planting along our roads as no artist could conceive. And in the midst of the destruction of the forests in the newer parts of the state there have been some men with enough love of nature and enough foresight to leave a few trees standing along our highways. In the older parts of the state, considerable planting has been done by individuals—true it has been hit-or-miss and some undesirable trees have been planted, but much of this planting is desirable. Let us preserve what is worth preserving of our existing plant growth.

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*Paper presented at the twelfth annual convention of the Michigan State Good Roads Association, Lansing, Mich., Sept. 1-3, 1920.

†District Engineer, Michigan State Highway Department.

Our first problem then would be the conservation of what tree and other desirable plant growth we already have. It would, indeed, be folly to cut the beautiful wild grape and bittersweet from our country roadsides and replace them with climbing roses; or to cut the native hawthorn, hazel, sumach, wild rose or sweet fern to replace them with lilacs, Japan quince and the like; or to cut the irregular groups of maples, elms, oaks, and other desirable trees to replace them with regular rows of Colorano blue spruce or other exotic varieties of trees. I do not wish to say that there is no place for the ordinary garden varieties of trees and shrubs along our roadsides, but only to emphasize the point that we should not destroy existing natural beauty simply for the purpose of trying out a different type of planting. It would be more reasonable, more economical, and the results would be more pleasing, to preserve what is suitable of the natural or existing growth and to supplement it with additional plant of the kind that nature suggests.

Our next problem would be to plant for protection. Many dangerous curves and fills could be made safe by the proper planting of trees. They would eliminate the necessity for warning signs and lessen the danger of accidents. The white birch, beech, sycamore and other trees are conspicuous in their color and would serve a useful purpose as warning signs at the outside of curves or along heavy fills.

In places especially in the northern part of the state we have trouble with drifting snow, which could be largely overcome by the planting of suitable trees. In this way we could eliminate the ugly snow fence and at the same time add greatly to the beauty of our roadsides.

The planting of trees along the highways is not a new idea. While we have as yet not gone into this matter on an extensive scale, for many years several European countries have carried out roadside planting with a comprehensive system. There fruit and nut trees have been planted extensively and there is no reason why similar planting in certain sections of our state would not be productive of good results. Apples, pears and sweet cherries, black walnuts, butternuts and chestnuts would be well adapted to roadside planting, though such planting could not be done so successfully in the thinly settled parts of the state, for such trees require proper spraying and other attention that they might fail to get except in the more thickly settled communities. Such trees would not only justify themselves in the fruit that they would bear, but would also add considerably to the attractiveness of the roadsides, especially in their season of bloom.

To a considerable extent our tree planting could be made to serve a useful as well as an ornamental purpose. Even our sugar maple, one of the most beautiful trees, will pay its way in the sap it produces, and if the trees are properly arranged, there is no reason why the maple, oak, black walnut and other varieties could not be thinned out from time to time to help out our dwindling lumber supply.

Aside from the fact that a tree planting program could be made to serve a useful purpose, the planting should be done if for no other purpose than for beauty alone. Beauty has no measure in dollars and cents, but it is a part of life. If we can add to beauty then life is the more worth living. Who can deny that our native trees have beauty and play a part in our lives? Fifty or a hundred years ago or more our forefathers were plantning trees that we now enjoy. Nature left in our charge magnificent forests which we have destroyed. Should we not be fair to posterity and start a comprehensive tree planting program that will in part replace the beauty that we have destroyed and give our children and their children the benefit of our forethought and labor?

Within the past few years real estate companies have quite generally had trees planted on the subdivisions that they place on the market, in many cases even before the streets were improved. If this were not good business it would not be done, and the fact that home seekers are willing to pay the extra cost is evidence of the desire that the mass of people have for attractive surroundings. If it is desirable to have attractive home surroundings it is equally desirable to be able to pass through attractive scenes in traveling for business or pleasure.

In developing our roadsides it is not enough to plant trees and shrubs and flowers, nor yet is it enough to preserve all that we have of existing plant growth, but it is necessary to preserve the desirable existing plant growth and to plant others of the right varieties and in the right arrangement. This cannot be successfully done without careful study of soil conditions, of the general type of country, and local tastes.

The beautifying of our highways must be planned on a comprehensive but rational scale. Near the cities and villages a more formal and refined type of planting, with trees planted in straight rows and spaced at regular intervals might be desirable, but as we get further from the thickly populated centers we should gradually change the type to a more free and natural arrangement of planting in irregular groups and masses.

Nature is the supreme landscape architect and she always is artistic but is never formal or regular in her arrangement of plantings. We can do no better than in general to follow her example. By a process of selection through the ages certain

(Concluded on Page 164)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

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Managing Editor

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A MILE AN HOUR

A mile an hour is about the average speed of freight over the railroads in this country, according to figures given in "Railway Age."

These figures show that in 1918 the average movement per car per day was 24.6 mi.; in 1919 it was 23.1 mi., and the greatest car movement ever attained by the railroads was 26.9 mi. in 1916. The railroads have now established certain standards of efficiency of operation and one of these is the increase of this average daily movement to 30 mi. per day, which will be equivalent to adding about 500,000 cars to the present equipment.

The highest average loading ever attained was 29.1 tons per car in 1919. It is now proposed to make this 30 tons and it is pointed out by the authority to which reference has been made that this will be equivalent to adding from 50,000 to 75,000 cars to the present equipment.

About 178,000 freight cars, or 7.4% of the total are reported to be in bad condition. Since 4% is about normal for unserviceable cars, the residual 3.4% may be attributed to the results of abnormal conditions. The railroads propose to reduce the cars in bad condition to a maximum of 4%.

Other ends to which the railroads are to direct their efforts are: "An early and substantial reduction in the number of locomotives unfit for service," and "more effective efforts to bring about the return of cars to the owner roads."

The figures noted and the fact that during the past few years the motor truck has relieved the railroads of an immense short-haul tonnage give rise to conjectures as to how bad the situation of the railroads really is, why remedies are so slowly applied and what effect the proposed betterment of operation will have on motor truck hauling.

PROVIDING FOR THROUGH MOTOR TRAFFIC IN CITIES AND TOWNS

The problems with which road builders are confronted as a result of the development of motor traffic involve chiefly methods of constructing and maintaining suitable roadways, financing such work and providing for the safety of all road users. Among other problems meriting more attention than they often receive is that of making provision for through motor traffic in the street plans of cities and towns.

Before the coming of the motor-driven vehicle there was little traffic through populous centers. Except for local traffic, practically all travel was into or out from a central point or points. It was all comparatively light; it all moved slowly; and, as its volume was not great, there was little or no congestion.

Present conditions are very different. The total volume of traffic has increased and its character has changed greatly. There is still the local traffic and the traffic between town and surrounding country, but, added to these two kinds, there is a third consisting of traffic passing through the town. And nearly all of the traffic, of all classes, is composed of motor-driven vehicles—trucks and passenger cars.

In the average small city or large town the route ordinarily followed by through traffic passes first through a residence section, often one of those of the better class, then through a section given over to small business and then through the central business section of the place and out through sections corresponding to those by which it entered, but in reverse order.

The result of adding this through traffic to the local traffic and that centering upon the city from the surrounding country is often great congestion, especially in the business center. This not only delays and impedes all traffic, but is often a fruitful source of danger.

From the local viewpoint, then, this through traffic might well be provided with detours leading it away from the main business streets. From the viewpoint of the drivers of through traffic also, this would be advantageous, for, as a rule, their chief concern is to get through the cities and towns with the least possible delay. They usually drive through the main streets and the business section only because they find the best pavements there or because, if they are unfamiliar with the place, they can most easily follow that route.

Under the circumstances, the authorities would best serve the interests of their cities and of traffic in general by so planning and improving their street systems as to provide well paved and clearly marked routes well away from the local traffic centers.

Removing Snow from the Highways

(Concluded from Page 156)

schedules of the army trucks. Stations were established along the highways where motor truck equipment with snowplow attachments, road machines, drags, shovels, etc., were located. The patrolmen regularly employed in maintenance work were used as a nucleus for the forces to handle the work.

Generally the equipment used in snow removal work consists primarily of snowplows, either of the blade, grader or V type, often supplemented by other forms of equipment. Snows up to 12 in. in depth can often be handled with road machines to advantage. Motor truck plow attachments are used to advantage on snow up to 3 ft. in depth. In using the truck with the plow attachment, a trip is usually made down on one side of the road and back on the other thus clearing the roadway and using a road grader or other equipment to clear off the shoulders. In Pennsylvania, heavy snows are combated with a large V-shaped plow, 30 in. high at the apex, 6 ft. high at the back, with 20-ft. legs and 16 ft. wide at the back. This plow is constructed with movable braces and is drawn by a heavy tractor and has proven a very economical and effective device in working on heavy and deep snow. The movable braces are provided so as to permit vehicles to pass.

Although many devices have been made for the removal of snow which apparently have appeared scientifically sound on a pleasant summer day, so far they have not met with any signal success and the snowplow in its various adaptations remains the basic snow removal equipment. Snowplows are of three types; the familiar V-shaped device usually horse-drawn, the road scraper, and the motor plow attachment, the last of which has met with great favor among road builders. Particularly in wet heavy snow the motor attachment has been found more efficient than the road scraper, because the latter device is much lighter than the motor truck and has a tendency to swing away rather than cut through the snow. Automobile plow attachments should be mounted on trucks of not less than 4 tons capacity and with an adjustable blade set at an angle of about 45 deg.

In cities, panning and flushing the snow into the sewers is often done instead of carting it to disposal dumps. The latter method may sometimes be economical under certain conditions, but is limited to temperatures above freezing. Panning, howeve
finds a wider application and can very often be use
to advantage in supplementing the work of snov
plows. In Philadelphia, the sewer system since 191
has been used to carry away immense quantities
snow each winter and it is asserted that this metho
of handling snow is more economical than any othe
Many experiments were conducted in New York Ci
on panning and it was found that the pushing
snow into the city sewers effected economy in dispos
of snow and elimination of traffic congestion.
the conference on snow removal held March 8, 191
A. E. Kalbach, Deputy Street Cleaning Commissio
er of the Bronx, stated that the cost per cubic yar
by panning was 12.1 ct. compared with the averag
cost by other methods of 57.3 ct. in the six precedir
years.

Intelligent snow removal work, either municip
or county, demands careful organization. Sufficier
and adequate equipment must be stationed at strat
gic points and men must be assigned to defini
posts of duty. The old method of allowing tl
snow to completely fall and block traffic must be su
planted by methods which aim to keep traffic mobi
at all times.

California Enabled To Continue Road Wor By Selling Bonds to Counties

Los Angeles County To Purchase $500,000 of Bonds Immediately and Road Program Will Go on in Spite of Pending Lawsuit

Because of the financial condition which confron
the California State Highway Commission, necess
tating the suspension of consderable work on sta
highways, the Board of Supervisors of Los Angel
County has resolved to invest $500,000 of surplu
county funds in state highway bonds. It is stat
that the county will be later asked to purchase a
other block of state highway bonds, perhaps to tl
amount of $1,000,000, it being expected that the pr
posed improvements in the Los Angeles section w
require about $1,500,000 of state expenditure.

Suits pending against the State Highway Cor
mission prevent the sale of state bonds by the pa
ment of the commercial discount required from bo
houses. In return for the aid which Los Angel
County is giving the state, it is agreed that the sta
will construct the $155,000 bridge over the Big T
junga River near Sunland.

By the sale of the state highway bonds to Los A
geles and other counties, the state will be able
continue its program of road building, which will i
clude the expenditure of $230,000 upon the Imperi
Valley Highway under the present contract; an a
ditional amount of approximately $340,000 on wo
being done with day labor on this same highwa
the completion of the Mint Canyon Road; the expe
diture of approximately $155,000 on the coast hig
way between Los Angeles and Ventura, and the co

struction of the bridge over the Tejunga River at a cost of about $155,000.

Former Secretary Ellis of the State Highway Commission has petitioned for a rehearing of his petition for a writ of mandamus, which was recently decided against him by the Third District Court of Appeals. Pending the final disposal of the case new work on the state highway system has been suspended because the state treasurer has been unable to market the highway bonds at par with their interest rate of 4½%.

Oregon State Highway Commission May Be Reorganized

Reorganization of the Oregon State Highway Commission by including the state highway engineer in the personnel of the body and providing salaries for the members commensurate with their duties, will probably be sought through a bill to be introduced at the next session of the Legislature, according to a statement by a member of the Oregon Legislature. At the present time the state highway engineer is subordinate to the commission, the members of which serve without compensation.

The state highway engineer, it is pointed out, devotes a considerable part of his time to inspecting roads for and under improvement and so is intimately familiar with the plans of construction, estimated cost and other details. If made an active member of the commission, it is contended that his advice and knowledge could be used to greater advantage.

New Jersey Highway Commission Inspects Roads

Travels 375 Miles in Three-Day Trip and Inspects Construction Work, Bridges, Grade Crossings and Proposed Routes for Roads

For the purpose of gaining first-hand information of the work contemplated and now being done on the highways of New Jersey, the State Highway Commission recently made a 3-day tour covering 375 mi. The commission, accompanied by State Highway Engineer Thomas J. Wasser, Assistant Highway Engineer Edward E. Reed, Bridge Engineer C. A. Mead and several other members of the State Highway Department, started from Newark and traveled over Routes Nos. 1, 2, 3, 4, 14 and 15 of the state highway system. Bridges, grade crossings and proposed highway routes were inspected. Roads in Cape May County were inspected at the invitation of the Bridgeton Chamber of Commerce, the state highway route in this county not yet having been selected.

Route No. 1 of the state highway system extends from Elizabeth to Trenton by way of Rahway, Metuchen, New Brunswick and Hightstown; Route No. 2 runs from Trenton to Camden by way of Bordentown, Fieldboro, Roebling and Burlington; Route No. 3 extends from Camden to Absecon by way of Berlin and Hammonton; Route No. 4 runs from a point near Rahway on Route No. 1 to Absecon, by way of Perth Amboy, Keyport, Middletown, Red Bank, Long Branch, Asbury Park, Point Pleasant, Lakewood, Tom's River, Tuckertown and New Gretna. Route No. 14 extends from Egg Harbor City to Cape May City through May's Landing and Tuckahoe, but some sections of this route have not yet been selected by the commission.

Kentucky Department of Public Roads Will Sue for Requisition of Convicts

The Kentucky Department of Public Roads will institute proceedings against the State Board of Charities and Corrections to honor a requisition for 500 prisoners to work upon the roads of the state next year. The board claims that it has only sufficient men to fill the prison shops and the suit has been started to clear up the matter so that the Department of Public Roads can prepare its program for the next year.

It is planned to establish permanent camps for convicts in road work, thus avoiding the expense of sending the men out in the spring and returning them to the prison in the fall.

Allegheny County, Pennsylvania, Plans To Spend $10,500,000 on Roads

Plans are being formulated for the improvement of 64 county roads in Allegheny County, Pa., at an approximate cost of $10,500,000. Under this program it is planned to build more than 80% of the proposed roads with asphaltic concrete and reinforced cement concrete.

At a recent preliminary discussion, the county commissioners tentatively selected the highways for improvement. In connection with the improvement of the Universal Road in the county, it was stated by Ray V. Warren, County Road Commissioner, that the Universal Cement Co. had agreed to furnish $10,000 worth of cement free for its improvement.

International Bridge Between Detroit and Windsor Is Planned

Proposed Structure Will Cost $28,000,000 and Will Be Built With Suspension Span 1,700 Ft. in Length and 2,000 Ft. Approach

Because of the greatly increased traffic between Detroit, Mich., and Windsor, Can., it is proposed to construct an international bridge spanning the Detroit River near 24th St. The plan under consideration provides for a suspension span of 1,700 ft., carrying two 28-ft. roadways, two 7-ft. sidewalks, two street car tracks and four railroad tracks, with a clearance at the harbor lines of 100 ft. The approaches, as planned, will be 2,000 ft. long, with 4% grades.

Figures have been compiled from which it is predicted that the number of passengers which will pass over the proposed structure will be 10,585,000 each year, with an annual traffic of 521,950 passenger automobiles, 73,000 motor trucks and 16,000 horse-drawn vehicles. It is thought that the probable increase in traffic will be much larger than represented by the foregoing figures. Approximately 1,700,000 freight cars cross the Detroit River annually and it is believed that the railroads that could utilize the bridge could guarantee by 1925 about $1,000,000 a year.

The proposed bridge will cost about $28,000,000 and it is reported that prominent financial interests have given assurance that about $10,000,000 will be provided.

Suit Instituted To Stop Marion County From Improving Road in Indianapolis

A suit has been instituted against the county commissioners of Marion County, Indiana, asking that the commissioners, the treasurer and the auditor of the county be permanently enjoined from selling bonds for the improvement of the Rinne Road, extending from Sunset Ave. to 62nd St., along the canal.

Bonds for the road amounting to $188,000 were recently advertised for sale and the complaint alleges that the county has no right to take over roads for improvement that are within the limits of corporate towns and cities. Part of the road selected for improvement lies in Indianapolis and part is in Broad Ripple.

Indiana Asks Public Service Commission to Allot Cars to Road Contractors

Many Roads in State Torn Up and Will Be in Bad Condition Until Next Season Unless Relief is Afforded Contractors

A petition with the Public Service Commission has been filed by L. H. Wright, Director of the Indiana State Highway Department, asking that stone, cement and other road building materials receive consideration in the distribution of open-top freight cars. Roads now under construction will remain torn up in many sections unless relief is afforded to the contractors in securing materials.

"During the year 1919," the petition reads, "the Indiana State Highway Commission let contracts for the construction of 135 mi. of hard-surfaced roads, which require a large amount of sand, gravel, cement, stone and other road material. This mileage is all upon the main highways of our state, and at this time has practically all been graded and is now in such condition that it is impossible for the public to travel over same.

"Unless the contractors can get some relief by securing cars to ship their material, the greater part of this mileage will remain in this condition through the winter and early spring. If we are given our just proportion of cars, a large part of this mileage will be hard-surfaced and the public will benefit thereby.

"In addition to this road mileage, we have in the neighborhood of $1,000,000 of contracts for bridges, which also require shipment of gravel, sand, stone, cement and steel. Many existing bridges are dangerous and must be taken care of at once in order to protect the public from serious accidents. Other bridges are a part of roads now under contract and should be completed along with the road."

Maryland Will Improve Highways in Montgomery County

The Maryland State Roads Commission has notified the County Commissioners of Montgomery County that it has decided to improve the following roads in the county as soon as preliminaries can be complied with: 3 mi. of the Silgo-Colesville Road; 2.8 mi. of the Gaithersburg-Muncaster Road; 3.5 mi. of the Rockville-Hunting Hill Road; 4 mi. of the Beallsville-Dickerson Road. Before the state will proceed with the plans for these improvements, the county must turn over the money from bond issues authorized by the last Legislature for the improvement of these roads. The money derived from the sale of these bonds amounts to about $181,000.

Texas Pushes Work on Meridian Highway

Construction of the Texas State Highway No. 2, or the Meridian Highway, is well under way, according to State Highway Engineer R. J. Windrow, who has issued a statement containing the following facts.

Three hundred and eleven miles of the 886 mi. of the Meridian Highway and its branches are under construction. In addition, project agreements have been executed on 394 mi., which means that 705 mi. of the total mileage of 886 mi. will be under construction within a short time, if the material shortage does not become too acute and if the increased freight rates do not necessitate cutting down the mileage. The 311 mi. under construction are divided as follows: 172 mi. gravel; 129 gravel with bituminous topping and 10 mi. concrete. There have been $226,518 of state aid and $1,867,002 of federal aid funds appropriated for this highway.

———ooo———

Linn County, Oregon, will offer $50,000 worth of road bonds for sale. This is a part of the road bond issue of $600,000 voted last year, of which $200,000 worth have been sold.

Beat One of Scott County, Mississippi, recently voted a bond issue of $110,000 for road improvements. The State Highway Department has allotted a like sum to this beat. Several hundred citizens spent the day before the election in working on the roads in the beat.

EQUIPMENT—TRADE—MATERIALS

Champion Snow Plow

An attractive booklet describing the mechanism, operation and use of the "Champion" snowplow, for attaching to motor trucks, has recently been issued by the Good Roads Machinery Co., Inc., 821 Bulletin Bldg., Philadelphia, Pa.

The "Champion" snowplow has a steel scraper blade, 10 ft. long and 21 in. wide, which is hung on a semicircular frame so as to provide angular adjustment. A lifting attachment, controlled by means of a hand wheel at the driver's seat, adjusts the scraper to various working conditions. Because of a specially designed axle clamp, the plow may be readily attached to any size or shape of axle.

Blaw-Knox Company Insures Employes

The Blaw-Knox Company, Blawnox, Pa., has recently instituted a free insurance system for its employees. All employees with not less than 3 months' service are insured for $500; those who have been with the company from 6 months to one year, $750; from one to two years, $1,000; thereafter with each additional year's service the insurance is increased by $250, until a maximum of $2,000 is reached. This insurance remains in force as long as the employee continues with the company and the entire expense is borne by the company. The benefits accruing from this insurance are additional to those which may be provided by the state workmen's compensation act.

F. C. Austin Consolidation

The Austin Machinery Corporation, of Chicago and New York, has announced the consolidation of the plants of the F. C. Austin Machinery Co., Inc., of Chicago, Ill.; the Linderman Steel & Machine Co., at Muskegon, Mich.; the Toledo Bridge & Crane Co., of Toledo, O.; the Municipal Engineering & Contracting Co., of Chicago, Ill.; and the F. C. Austin Drainage Excavator Co., at Winthrop Harbor, Ill.

The combined plants will be devoted to the mass production of a complete line of earth moving and concrete mixing machinery, and distributing points are to be established throughout the world. The capitalization of the company includes $15,000,000 of preferred stock and 200,000 shares of common stock.

B. A. Linderman, President of the Linderman Steel & Machine Co., Muskegon, Mich., is the president of the corporation and also a member of the Board of Directors. The other directors are: Ralph Crews, Director, National City Co., New York, N. Y.; Clay H. Hollister, President, Old National Bank, Grand Rapids, Mich; Samuel McRoberts, formerly Vice President, National City Bank, New York, N. Y.; C. A. Peckham, President, Toledo Bridge & Crane Co., Toledo, O.; and John R. Shaw, Vice President, Canadian Manufacturers' Association, Woodstock, Ont.

Five Large Chemical Corporations Combine.

The Barrett Company, the Solvay Process Company, the Semet-Solvay Company, the General Chemical Company and the National Aniline and Chemical Company will merge and form the Allied Chemical and Dye Corporation. This action will be taken in accordance with the decision of the stockholders' committee for the new chemical merger. The authorized capital stock will be $65,000,000 in 7% cumulative preferred stock of par value of $100 per share, and 3,000,000 shares of common stock of no par value.

The firm of Chris D. Schramm & Son, Inc., has announced the removal of its administration offices to West Chester, Pa., where the factory is located. A sales office will be maintained at 709 Arch St., Philadelphia, Pa., the location of the former main office.

The Jeffrey Manufacturing Co., Columbus, O., has opened a new branch office in the Marine Trust Bldg., Buffalo, N. Y. H, W. Scott, formerly of the home office of the company, has been placed in charge of the Bualo office. Mr. Scott has been connected with the sales and engineering departments of the company for a number of years.

The town of Belmar, N. J., recently purchased a Nash Quad, equipped with a gravity sprinkler tank, hydraulic hoist and a dump body. The town is now using this truck equipped with dump body and hoist to haul sand and gravel from the pit, for construction purposes. During the winter months it is proposed to equip the truck with a snow plow for the purpose of keeping the roads clear.

The Austin Machinery Corporation, Chicago, Ill., has applied for a patent on a new design of the Austin cube mixer drum. The new design is called the "Cube-Hex" and the mixing action is facilitated by the addition of 6 extra planes which throw the concrete across that thrown by the 6 side planes. It is claimed that the dry mix, specified by many states, is secured much more quickly by the introduction of these additional planes.

MEETINGS

Calendar of Coming Meetings

Oct. 6-8.—League of Kansas Municipalities.—Annual convention, McPherson, Kan. Secretary, Albert A. Long, University of Kansas, Lawrence, Kan.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Nov. 8-12.—League of California Municipalities.—Annual convention, Chico, Cal. Executive secretary. W. J. Locke, Pacific Bldg., San Francisco, Cal.

Nov. 15-17.—City Managers' Association.—Annual convention, Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York, N. Y.

PERSONAL MENTION

J. Milne, Municipal Engineer of Saanich, B. C., Canada, has resigned.

G. G. Girling has resigned as road superintendent of Saanich, B. C., Canada.

Stanley Shupe has been appointed acting town engineer of Oshawa, Ont., Canada.

E. B. Allan has been appointed assistant to the road engineer of Hamilton, Ont., Canada.

Karl Riddle has resigned as resident engineer on federal aid work in Dickinson County, Kansas, and is now city manager of South Palm Beach, Fla.

W. S. Fitzsimons has resigned as assistant engineer in the Charleston, S. C., office of the U. S. Bureau of Public Roads, to enter private practice in partnership with James P. Allen.

Beautifying Our Roadsides

(Concluded from Page 158)

varieties of trees have proven their adaptability to our climate and soil conditions and these varieties look in perfect harmony. Let us take nature's findings and confine our plantings for the most part to the kinds of trees and shrubs that grow naturally in Michigan and arrange them in natural groupings and colonies according to the soil conditions in which they will do best. Above all let us keep away from the idea that beautifying our roadsides consists of planting straight rows of regularly spaced trees throughout our road system.

As road officials looking to the interest of the traveling public, we should acquire small areas having natural beauty along our highways to be used as wayside parks.

A small triangle at a road intersection, a strip along the shore of a lake or along a sparkling brook would be a pleasant place for the traveler to stop and rest. Such small wayside parks would properly be a part of the road system, and would not conflict with the larger park program of the State Park Board, but would rather supplement its good work. They could easily be maintained together with the road maintenance and it is not a far sight into the future to foresee a general movement toward such small parks, perhaps equipped with comfort stations, drinking fountains and other conveniences for public use.

How much per mile will it cost to beautify our roadsides? If we would take the money that has been spent in advertising signs and spend it wisely, the average mile of main traveled road could be made attractive. When we entirely eliminate the advertising sign from our highways we will be well on the way to beautiful roadsides, and it will not cost us one cent to refrain from making our roadsides ugly by the use of such signs.

Let us make our roadsides beautiful, but let us do it in a sane and reasonable way. Let us first conserve what we have of beauty, then let us clean up and eliminate the ugly and unattractive, and then let us apply ourselves to the planting of more trees and shrubs, vines and flowers. What will it cost? The cost will be insignificant compared to the results, if we plan our work wisely. The wearing surface of a road will wear out and need replacement; the trees planted along a road will increase in beauty from year to year. The cost of trees should be measured more in years than in dollars, but the value of beautiful trees on our highways cannot be measured.

———ooo———

The Victoria Bridge, Montreal, Canada, had 14 spans of its wooden pavement partially destroyed by fire on Aug. 22. The steel superstructure was not seriously damaged.

The Maryland Board of Public Works has voted to purchase $1,000,000 of the state's highway bonds for the sinking fund. Such action enables the state to dispose of its highway bonds at par.

The construction of a Boulevard in Cleveland, O., between Edgewater Park and Brookside Park and between Woodland Hills and Garfield Park, has been postponed because of the high prices of materials and the scarcity of labor.

A Road near Richmond, N. H., was recently damaged by lightning and cloudburst to the extent of $10,000. The lightning first tore a hole in the road at the top of an incline and the water following tore up about half a mile of the road.

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*Illustrated article

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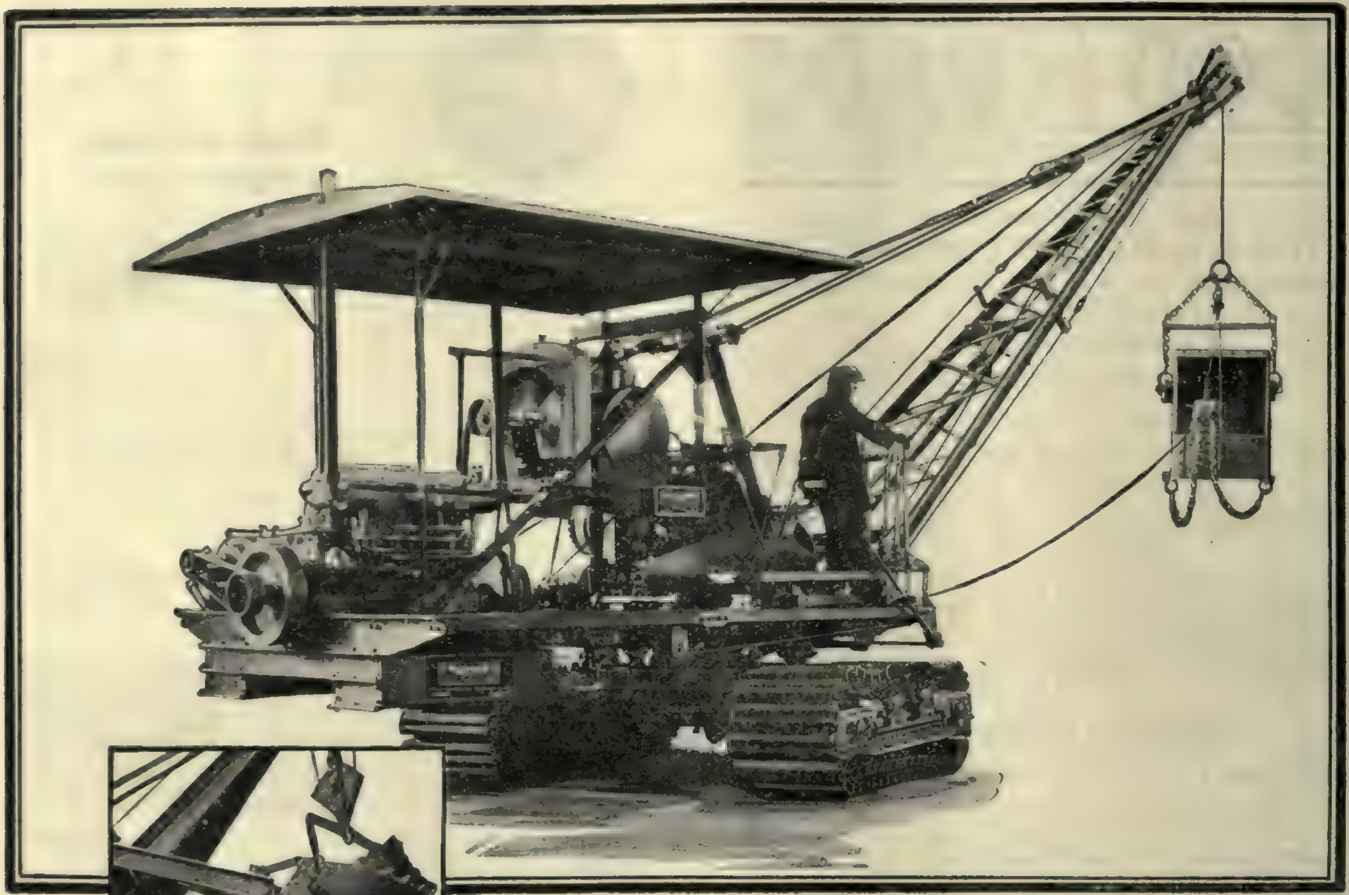

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX

JAMESTOWN, N. Y., OCTOBER 6, 1920

Number 14

Park Roads and Private Estate Driveways

By J. B. ELLIOTT*

The road problems in parks and in private estates are practically the same, as the basic principles of repairing old macadam and gravel roadways are applicable in either case. Heavy traffic streets are too expensive for parks and estates, and furthermore their appearance does not conform with the landscape and scenery.

Almost without exception the driveways in our public parks were improved for several years with either macadam or gravel. Such roads were easily and economically repaired and maintained before the advent of automobiles made necessary a more permanent surface. It is acknowledged by some of the most expert engineering authorities on road construction that a well compacted macadam or gravel base is equal to a concrete base under the average conditions existing in parks or private estates, when the gravel or macadam surfaces are kept well waterproofed and are undisturbed by heavy traffic. When such road conditions are found it is a wasteful expense to tear out these excellent foundations. The reconstruction of a wearing surface at the least expense is what confronts the engineers and park superintendents.

The old macadam and gravel roads in Forest Park, St. Louis, Mo., have been reconstructed very economically by resurfacing with asphalt. The method and outline of specifications used were as follows:

The surface of the old road, after being cleaned of all loose dirt, shall be scarified at least 1 in. in depth and if possible reshaped 2½ in. below grade and thoroughly rolled.

If after rolling, the surface is more than 2½ in. below grade, it shall be brought up with suitable stone and thoroughly filled with sand or screenings.

The wearing course shall consist of stone passing

Drive on the McKinlock Estate

Drive on the Dick Estate

ASPHALTIC MACADAM DRIVEWAYS ON PRIVATE ESTATES AT LAKE FOREST, ILLINOIS a 2¼-in. ring and retained on a 1¼-in. ring, spread to a finished depth of not less than 2½ in., thoroughly keyed by rolling but free from dirt or dust or any material which will prevent penetration of the asphalt.

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*Representative, Middle Western Division, Asphalt Sales Department, The Texas Company.

Asphalt heated to a suitable temperature shall be evenly spread over the surface by pressure spray to an amount of not less than 1½ or more than 1¾ gal. per square yard.

An application of ¾-in. stone, free from dust, shall be made evenly over the surface while the asphalt is still hot, filling the voids, and shall be rolled until firm. Care shall be taken to leave no loose stone on the surface.

The road shall be swept free from any loose stone not held by the asphalt and ½ gal. of asphalt per square yard applied by pressure spray.

Stone screenings, small pea gravel or sharp sand shall be evenly spread over the surface and rolled until compacted, leaving enough surplus top dressing on the surface to protect it while setting up.

Careful workmanship and close attention to details should be exercised in the construction of an asphalt penetration roadway. Any defects in the different steps of construction will affect the surface and durability of the finished road. Under normal conditions, the roads in Forest Park are maintained by a surface treatment of ⅛ to ¼ gal. of asphalt per square yard, at an annual cost not exceeding 3 cts. per square yard.

The total cost of an asphalt macadam road, including construction and maintenance over a period of 20 years, will be less than the first cost of some of the more expensive so-called permanent pavements. The asphalt penetration type of construction is becoming more popular each year in parks and private estates on account of low construction and maintenance cost. From an esthetic or landscape point of view, the natural effect can be produced and maintained with asphalt by the careful selection of the top dressing.

Bridge Over Columbia River Planned

Bills will be introduced in the Oregon and Washington Legislatures providing for preliminary surveys for a proposed bridge across the Columbia River from a point on the Oregon shore adjacent to Wauna or Westport to Puget Island, and thence to the Washington side. The proposed bridge will form a connecting link between the highways on both sides of the river.

The plan as outlined is for Clatsop and Wahkiakum Counties to construct the bridge, under authority from the two states, and charge toll, thus raising funds to pay interest, operating expenses and create a sinking fund. It is stated that but one drawspan will be required, as the elevation of the structure between the island and the Washington shore will permit vessels to pass under.

Peru Enacts Compulsory Road Work Law

A road law has been passed in Peru requiring all males from 18 to 60 years of age to work on the public highways a certain number of days each year. Money may be paid to the government by any citizen in lieu of personal services. Peru has a highway system embracing 1,040 mi. and plans to construct an additional 391 mi. It is expected that most of the citizens of the country will pay cash instead of working on the roads and the revenue which will be derived from this source, it is estimated, will amount to about $2,500,000 per year.

Impact of Solid and Pneumatic Tires on Road Surfaces

Bureau of Public Roads Conducts Tests Which Which Show Impact is Increased by Speed of Vehicle and Also by Solid Truck Tire

The work of the U. S. Bureau of Public Roads in conducting impact tests is progressing rapidly, and already sufficient tests have been made to show that increased speed of a vehicle equipped with hard rubber tires tremendously increases the impact which its wheels make on the roadway where there is any unevenness. On the other hand, where pneumatic tires are used, increased speed adds comparatively little to the impact. It has been suggested that these tests will be of great value not only in setling question of design, but may also lead to a rational basis for determining license fees for motor vehicles.

Trucks have been used in these tests varying in size from a 1-ton up to a 7½-ton truck carrying an excess load. Each truck was run over a special recording device imbedded in the roadway and the impact which resulted when one of the wheels made a 2-in. drop from a ledge built in the surface was recorded.

Recent tests were made with a 3-ton truck loaded so that the weight on each rear wheel was 7,000 lb., the unsprung portion being 1,700 and the sprung portion 5,300 lb. The truck was equipped first with an old solid tire that was worn down to a thickness of 1 in. Then, with exactly the same load on the truck, a wheel was fitted with a new solid tire 2½ in. in thickness. And finally, the truck was equipped with pneumatic tires 42x9 in., blown up to a pressure of 142 lb. per square inch. The following table shows very clearly the bad effect an old tire is likely to have on a road surface and the greatly lessened impact which is produced by trucks equipped with pneumatic tires. The tests show that as the vehicle's speed was increased, the impact from the old hard rubber tire increased greatly. The impact from the new tire was somewhat less.

Speed.	Height.	Old Tire.	New Tire	Pneumatic Tire
5.7 mi.	2 in.	11,600 lb.	9,400 lb.	7,100 lb.
10.2	"	18,500	14,100	7,900
14.6	"	26,500	18,700	8,330

The Columbia River Highway in Oregon

Work in Progress Visited by Engineers at the Fiftieth Annual Convention of the American Society of Civil Engineers held at Portland—Description of the Highway and its Construction

By F. J. BRADY*

The American Society of Civil Engineers held its fiftieth annual convention on the Pacific Coast at Portland, Ore., Aug. 10, 11 and 12. Of the members attending the convention, about one-half were from the Pacific States and the balance were from the East. Practically every state was represented by men in the front ranks of the engineering profession, and it is claimed that the convention had a larger and more representative registration than any for several years.

Highway construction is one of the most important considerations of the society and the official program included a day's inspection of about 100 mi. of roads in the vicinity of Portland.

The engineering features of the Columbia River Highway between Portland and Hood River were summarized, as information to the engineers, by a circular printed by the Portland Press Club for distribution to the members and as its contents are of general interest to engineers, I am taking the liberty of quoting from same, and wish to give due credit to the Portland Press Club for assembling the data. The following paragraphs are from that circular.

Details of Construction on Columbia River Highway

The Columbia River Highway follows the Columbia River from Astoria to Pendleton, a distance of 365 mi. With the completion of present construction it will be a continuous stretch of pavement (Bitulithic) from Hood River to Astoria—a distance of approximately 185 mi. The road will be distinguished as representing the very best in modern highway construction. At several points it became necessary to pierce perpendicular cliffs with tunnels. Mitchell Point Tunnel is a replica, though longer and on a greater scale, of the famous Axenstrasse Tunnel in Switzerland. To maintain a maximum grade of 5%, series of loops, the road crossing itself several times, were constructed at different sections.

VIEW ON THE LOWER COLUMBIA RIVER HIGHWAY—SHOWING WARRENITE-BITULITHIC ROADWAY WITH MACADAM SHOULDERS AND THE TYPE OF FENCE USED

Aside from its scenic beauty, the Columbia River Highway is of invaluable economic value. The traffic from Astoria to the centers of trade and population is compelled to pass over it, while it is the road connecting eastern and western Oregon. The traffic from eastern Washington, Idaho, and the vast Inland Empire of Oregon, coming to Portland and thence to California, finds it necessary to pass over this famous thoroughfare.

Cascade Locks is the very heart of the Cascade Range of mountains. Within two miles the character of the country changes. Vegetation, topography, precipitation and character of soil mark the transition from western to eastern Oregon. Even the Columbia River at this point, where the Government has constructed a series of locks, flows over a series of rapids marking the boundary line of east and west. Take all in all, the Columbia River Highway from Astoria on the shores of the Pacific to Pendleton in the midst of the granary of the West, presents a kaleidoscopic scene unequalled anywhere in the known world. The magnitude of the undertaking by a sparsely settled state with limited resources is an eloquent tribute to its people for their enterprise, vision and confidence in the future of their country.

Distance

The distance is about 67 mi., including three 10-mi. approaches running east out of Portland; namely,

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*Member, Portland Press Club, Portland, Ore.

OPERATIONS IN A BASALT QUARRY ALONG THE LOWER COLUMBIA RIVER HIGHWAY

Sandy Road, Base Line Road, and Powell Valley Road, which are generally considered part of the Columbia River Highway.

Preparation of Roadbed

All preliminary work was done by Multnomah County by day labor, the total cost, including engineering, being approximately $1,675,000.

Bridges

Reinforced concrete was used for the bridges in all cases.

Dry Rubble Masonry

Blasting the road out of the mountain side and thus marring the natural beauty was avoided by construcing the road in many places (aggregating 3.5 mi.) on dry wall masonry. These walls have a base width 80% of the height and the height in several places exceeds 30 ft. The dry masonry walls and coping were patterned after the Italian walls, and were designed by S. C. Lancaster, the engineer in charge of preliminary work on the highway, after a special study of European practice and design, in conjunction with Hon. Samuel Hill.

Drainage

Special care was taken by the engineers in charge to have the roadway well drained. At some points "blind drain" bleeders were led from the road—where seepage from sidehills was encountered—and at other points concrete drains were constructed to carry the water away from the roadbed. The road is well ditched with a view to keeping the water out of the subgrade.

Grades

In no case does the grade exceed 5% along the entire length of the highway. Great expense was involved in meeting this highly important requirement, owing to the topography of the mountainous country through which the road passes.

Width of Roadway

The pavement is 18 ft. wide with 2-ft. macadam shoulders, making a width of 22 ft. over all. All curves were widened from 2 to 10 ft. The road is superelevated on curves, but no attempt was made to take care of a motor speed on curves of greater than 15 mi. per hour, as it was considered, on account of the general condition of traffic and topography of the country, that a higher speed was dangerous. No headers were used along the edge of the pavement, and the crushed stone shoulders blend into the pave-

ALONG LOWER COLUMBIA RIVER HIGHWAY VIEW OF CRUSHER (NO. 5 GATES WITH AUXILIARY NO. 2 GATES)

SETTING UP A WARRENITE-BITULITHIC MIXING PLANT ALONG THE LOWER COLUMBIA RIVER HIGHWAY—ABOUT READY FOR OPERATION

ment with no tendency of the pavement to ravel on the edges, this being due to the malleable and rich condition of the wearing surface.

Pavement

The type of road surface adopted was a dense asphaltic concrete (Bitulithic), 2 in. in thickness, laid over a well compressed stone foundation, 4 in. in thickness after compression. The contract was awarded in June, 1915, and, except for 5 mi., was completed prior to Nov. 1 of the same year.

The cost of the road surface and foundation was about $22,000.00 per mile. Being constructed under the comparatively low labor rate of 1915, and suitable basalt stone being available along the entire road paralleling railroad, this cost could not be duplicated in most sections of the country.

On the Base Line Road, Sandy Road, and Powell Valley Road, leading to the highway from the Portland city limits, the 2-in. Bitulithic wearing surface was laid over the old macadam road surface which had served its usefulness under the main artery traffic leading out of Portland. The cost of resurfacing these roads was approximately $15,000.00 per mile.

Other types of road were offered at great initial saving over the type of road selected, but Bitulithic was adopted as the type of wearing surface to be used, because of its proved service over a period of 12 years in many cities in Oregon, including Portland, where upward of 3,000,000 sq. yd. were in use at that time, including many of the down-town streets, all of which were laid on a crushed stone or macadam foundation similar to the Columbia River Highway Construction.

Safety First

The road surface at all times has been suitable for traffic, and except for those due to a few speed maniacs there have been no accidents to mar the pleasure that the road gives to upward of 10,000 vehicles on holidays and Sundays; and the road is now passing its sixth year.

Fences

Fences with 8x8-in. fir posts with three 2x8-in. fir rails are placed at all points on the road where the conditions make the same needed. For a guide at night these fences are painted white. The type of fences on the highway has been adopted by U. S. Office of Public Roads as a standard on all roads constructed under Government supervision.

SHOWING THE TEMPORARY WOODEN HEADER AND THE 12-TON "BUFFALO ROLLER" COMPRESSING THE WARRENITE-BITULITHIC SURFACE—LOWER COLUMBIA RIVER HIGHWAY

Stone Walls

Heavy stone masonry walls are erected at the most dangerous points as a coping to the dry rubble masonry supporting the highway, and at many points concrete curbs with steel edge protect the traffic against carelessness.

Accommodations for the Traveling Public

Rest houses are provided at Crown Point (Vista House—cost approximately $100,000.00), Waukena Falls, Multnomah Falls and Eagle Creek. Lunch tables, camp fires and free fire-wood are available at all camp sites at the principal points of interest along the road.

The Oregon state fish hatchery at Bonneville is open to the public for inspection at all times.

Many members of the Society also studied the construction details of the roads now under construction by the Oregon State Highway Commission on the Columbia River Highway between Portland and Astoria (about 105 mi.), known on the Coast as the Lower Columbia River Highway, in contra-distinction to the Upper Columbia River Highway between Portland and Hood River, the latter section having been completed about six years. On the Lower Columbia River Highway there are five plants in operation and the work is being rushed by both day and night shifts, with a view to completion before the rainy season.

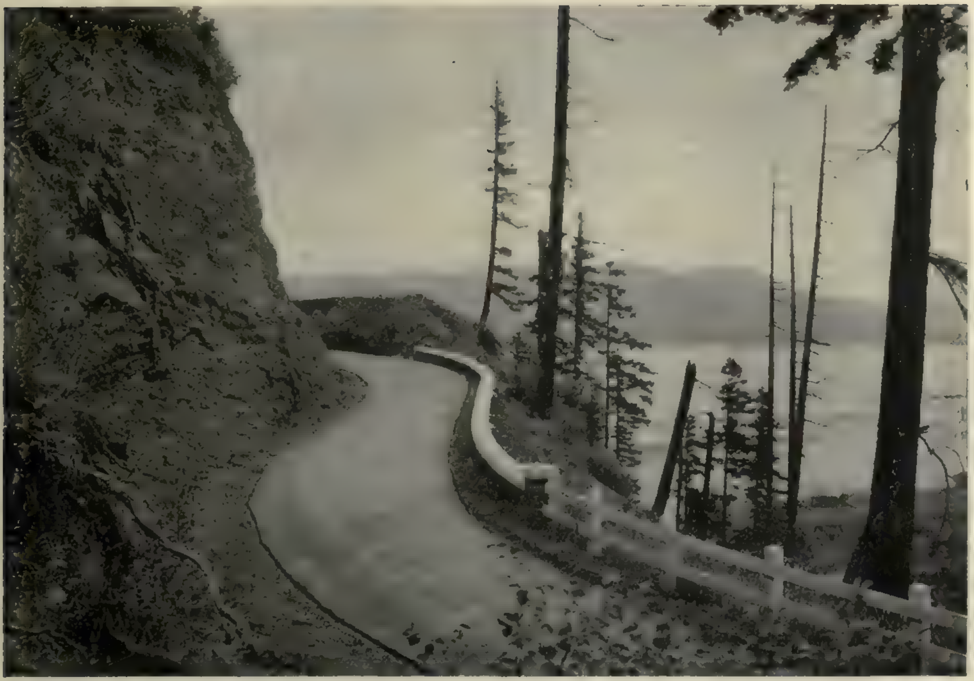
The accompanying illustrations of construction work were made from photographs taken at the time of the convention and will be of general interest to engineers who could not make the trip to attend the convention owing to the pressure of home duties.

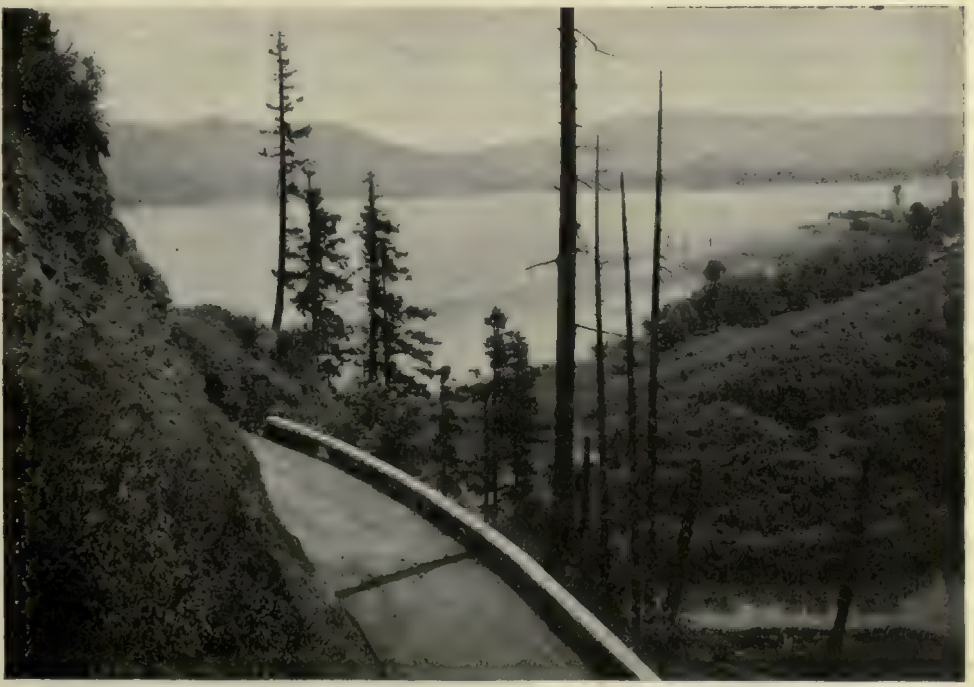
Many other highway projects in the vicinity of Portland were examined by the engineers, including the Pacific Highway from Portland to the California line and the highway from Portland to Tillamook and the coast beaches. The same type of road surface—Bitulithic—as is used on the Upper Col-

Views Along the Columbia River Highway

Lower Columbia River Highway between Portland and Astoria—Showing types of fences and Warrenite-Bitulithic surface on compressed foundation.

At Right—One of the many bridges. All of the structures are of reinforced concrete. The Warrenite-Bitulithic surfacing with which the highway is paved is carried across them and the fences are replaced by ornamental railings.





Views Along the Columbia River Highway

At Left—Warrenite-Bitulithic pavement ready for construction of macadam shoulders; showing Italian wall, fencing and drainage.

Below—Picturesque section of roadway patterned after Italian mountain roads. Note wall coping in both views.

umbia River Highway has been used on practically all of the road-work by the Oregon State Highway Commission. The foundation under the pavement is, generally speaking, either old macadam or new macadam, both of which types are in use on the Columbia River Highway, but dense asphaltic concrete base is used in places to meet the economic conditions, drainage, etc. The type of foundations were selected with a view to the greatest utility and as far as possible the old road foundation was utilized and special attention was given to drainage.

In returning from Portland many of the delegates visited Spokane, Seattle, Vancouver and California, many of them touring over the roads that are being built by the state highway commissions of the several states on the Coast.

Many roads are now under construction in the states of Washington, Oregon and California, and it is estimated that within three years there will be a paved highway from the British Columbia line to the Mexican line.

Will Build Bridge Over Yadkin River

The North Carolina Highway Commission recently let a contract for the construction of a bridge across the Yadkin River, between Stanley and Montgomery Counties, on the Charlotte-Raleigh Highway. The bridge will be 1,100 ft. lolng, at an elevation of 34 ft. above high water, and is to be finished in 300 working days. The structure will cost $175,000. The contract was awarded to Corwell & Young Co., of Macon, Ga.

West Virginia Bankers Want Good Roads

The Good Roads Committee of the State Bankers' Association of West Virginia has sent a letter to all bank officials of the state calling attention to the necessity of good roads and urging their support in passing the constitutional amendment for good roads at the November election. This amendment is designed to permit the Legislature to issue bonds for road building and has been endorsed by the State Bankers' Association.

Asphaltic Pavements and Stone Road with Bituminous Surface Treatments*

By WM. H. CONNELL†

Road building is like any other business undertaking. When you start in business you do not start at the top; you organize a company, usually in a small way and you gradually build it up until it becomes a big corporation. The same thing applies to roads. You have to creep before you walk, and it is the pioneer work that makes possible a good road system later on. You should not be discouraged because you cannot always lay one of the more or less permanent types of pavement. It would not be the thing to do, in many instances, for the cost would be too great for the amount of traffic to be carried.

The whole problem must be viewed from a cold-blooded business standpoint. The type of road determined upon should be the one you are justified in building, after giving due consideration to the locality and the amount of traffic.

I believe that the time is close at hand when a road connecting big cities will have two types of surfacing, one for passenger automobiles and one for trucks. I do not believe that road builders should seek the passage of legislation limiting the weight of trucks, but should strive to limit truck weight per inch width of tire. Trucks are going to be used more and more, and no matter how we try to limit their carrying capacity, they are going to increase in size, the limit being a size that will permit two trucks to pass on an 18-ft. road.

Several months ago I was asked to say something on this subject and I said that the time was coming when we would have steel tracks, with granite blocks between them and on the shoulders, to take care of the truck traffic between such cities as New York, Philadelphia, Baltimore and Washington. At present our roads carry heavy trucks as well as passenger cars, and in many instances the truck traffic is too heavy for the type of road that will satisfactorily serve the passenger traffic. The result is that our passenger routes are often ruined by freight carriers—although the greater part of the traffic consists of passenger cars. The economic solution of this problem would seem to be to have separate routes for trucks.

There are two general methods of building asphaltic concrete roads, one utilizing a macadam foundation and the other a cement concrete foundation. I believe that asphaltic concrete gives better results when laid on an old broken stone macadam or gravel road that has been used for a number of years and is sufficienty compacted than when laid on concrete. A concrete foundation will crack and the pavement will crack through to the surface. Cracks do not seriously injure the pavement, for they can be bound up with a little bituminous material, but with an old macadam or gravel road as a foundation, that trouble is not encountered.

The asphaltic concrete pavement that has been most successful, contains about 7½% of asphalt, from 8 to 10% of limestone dust or Portland cement, from 55 to 60% of stone passing a 1¼-in. ring and from 25 to 30% of sand—all properly graded.

A modified asphaltic concrete, commonly designated as the Topeka type, contains about 8 or 9% of asphalt, 12 to 14 of limestone, 35 to 40% of sand and from 40 to 50% of stone passing a ¾-in. ring. This has given very satisfactory results.

A great many engineers have said that the day of the macadam has passed and that it will not stand up under present-day traffic in localities where there is considerable motor truck traffic. It will stand up and will last indefinitely under passenger automobile traffic if given a surface treatment as frequently as required, under some conditions every year and under ohers every two or three years. It has been proved in New York City and in Philadelphia that an ordinary broken stone road subjected to passenger automobile travel, can be made to last almost indefinitely, at a very modest cost, if given constant attention. Give it surface treatment when needed; patch it, and give it the day to day attention that it requires and a macadam road will give first-class service until the time when it has to be turned over to heavy motor truck traffic.

The Grand Boulevard and Concourse, a macadam highway leading through the Borough of the Bronx on the New York and Boston route, was resurfaced with tar in 1910. It carries from 10,000 to 12,000 automobiles daily and has been kept in good condition by constant maintenance and by retreatments when required.

In the eastern and middle Atlalntic states, there are thousands of miles of old macadam roads that have been given light surfaced treatments with tar or cut-back asphalt. Those that have been maintained are in first-class condition today.

If there is any message that I would like to give, it is this: Do not be frightened into ripping up old stone roads and replacing them with more or less permanent types of pavements. Give these roads

(Concluded on Page 174)

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*Abstract of portions of an address presented at the seventh annual meeting of the Canadian Good Roads Association, Winnipeg, Man.

†Consulting Engineer; formerly Chief Engineer of the Bureau of Highways and Street Cleaning, Philadelphia, Pa.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX OCTOBER 6, 1920 No. 14

WEIGHING LOADED MOTOR TRUCKS

Plans for weighing motor trucks suspected of carrying loads in excess of the legal limits have been put into operation in some states, according to recent reports. These steps have been taken, of course, because the practice of overloading trucks results in undue damage to the road surfaces and, consequently, works a hardship upon those users of the highways —who are in the vast majority—who are content to use and not abuse.

While the policy of building the roads to fit the loads rather than that of trimming the loads to fit the roads is the one that must govern eventually, it will have to be followed with reason.

Only a very small percentage of the country's road mileage has been improved to the point where it can sustain heavy motor truck traffic. The remaining mileage, and even that portion requiring heavy traffic pavement, is large. And road work, particularly under existing conditions, is slow and costly.

For these reasons, it will be some time before the highways required as the nation's heavy traffic thoroughfares can be put into condition to carry the excessively heavy units of modern highway transportation. In the meantime, unless the work already done is to be lost, the roads paved only for moderately heavy traffic must be conserved. This can be done only by placing some limit upon wheel loads.

Steps to effect such conservation should not be condemned as retrogression. They are necessary to the ultimate aim of all road betterment—the providing of adequate transportation facilities for the nation's business.

A NEW DEVELOPMENT OF MOTOR HAULING IN ENGLAND

A noteworthy step in the development of highway transportation in England has been taken by the adoption of a plan for facilitating intercity hauling, according to a report printed on another page of this issue.

The plant, it is stated, contemplates the establishment of "clearing houses" for motor transport, by means of which all the principal shipping points will be taken care of and return loads will be provided for already been appointed, it is said, and through them the needs of local manufacturers and merchants will be taken care of and return loads will be provided for haulage concerns.

Since, in many ways, England has gone further than the United States in the development of highway transportation, this new undertaking should prove of especial interest in this country.

ROAD IMPACTS TESTS

A report on the progress being made by the Bureau of Public Roads in conducting tests of the impact of traffic upon road surfaces is given on another page of this issue. These tests will be watched with unusual interest by highway engineers, for the results promise to have far-reaching effects upon road building.

One of the weaknesses of present practice in road design is a lack of exact and specific knowledge of the effects of traffic. It is known that vehicles of certain types cause greater wear than those of other types and that, in general, the greater the speed and the greater the weight, the greater will be the wear upon the road surface. But road builders have comparatively little knowledge of the amount of wear, either absolute or relative. Most studies of road wear have been qualitative rather than quantitative.

This regrettable lack of data is not due to any failure on the part of engineers to appreciate the need. In order to get results worth while, investigations must be very thorough. That means that the work is costly—too costly to be undertaken with the limited funds available to most state highway departments for that sort of work. That leaves the Government as about the only agent in a position to undertake it, and the funds of the Bureau of Public Roads are none too great. There is much need for the appropriation of more nearly adequate funds for road research.

London to Experiment With Rubber Pavement

In a few sections on the streets of London, England, rubber has been used to deaden the sound, and experiments will be made to determine the efficiency of this type of surfacing. Rubber will be laid on one half of the street in flat slabs ¾ in. thick, anchored by plates of steel ,and the other half of the street will be paved with other material, thus affording the opportunity to observe the relative wearing qualities of the rubber.

Two Grade Crossings in Luzerne County, Pennsylvania, Will Be Eliminated

The complalints of the Pennsylvania State Highway Commission against the condition of two grade crossings on the line of the D. L. & W. in Beach Haven, Luzerne County, have been sustained by the Public Service Commission and their abolition ordered.

The railroad is to pay $20,000 towards the relocating of the state highway and the State Highway Department will carry out the work. Luzerne County will pay 80% of the damage for taking property and Salem Township will pay the remainder.

New Jersey Senate Confirms Appointment of Burton on Highway Commission

The appointment of George L. Burton, of South River, N. J., as a member of the New Jersey State Highway Commission, was confirmed by the Senate on Sept. 15. Burton and seven others were appointed members of the State Highway Commission by the governor in July, but the Senate refused to confirm the appointment of Burton. It is expected that Burton will immediately take his seat and will be chosen chairman of the commission, as he held that office on the de facto board existing between the ousting of the old board and the confirmation of the new one.

West Virginia Town Celebrates Opening of a Paved Street

The growth of civic interest in better streets and highways manifests itself frequently in gay celebrations and demonstrations when a street or road is improved. Even New York City recently witnessed a procession of citizens, headed by Mayor Hylan, celebrating the opening of a ferry connecting the streets of upper Manhattan with the Borough of Queens.

Ravenswood, W. Va., a town of about 1,500 population, recently celebrated the opening of a concrete paved street with an automobile parade and addresses by prominent men. Among the speakers was Maj. C. P. Fortney, Chairman of the West Virginia State Highway Commission. According to Wright McCroba, County Road Engineer of Jackson County, this is the first instance in the history of West Virginia when the completion of a federal aid project was celebrated with a brass band.

Pennsylvania Distributes Unclaimed Road Funds to Townships

Townships in 24 Counties Will Receive $221,651.17 of Unclaimed Reward Funds.

Townships in 24 counties of Pennsylvania will benefit by the failure of other townships to apply for their share of the $1,000,000 reward fund which the 1919 Legislature set aside for second-class townships as a reward for township road construction. Of the $1,000,000 fund, $221,651.17 was not applied for.

State Highway Commissioner Lewis S. Sadler has redistributed this sum among townships in 24 counties which have already received their quota. Among the counties whose townships will receive the additional funds, are:

Berks, $15,359.61; Centre, $7,020.30; Carbon, $3,272.29; Chester, $14,739.75; Clinton, $3,272.29; Dauphin, $6,090.51; Delaware, $1,967.70; Lancaster, $18,502.16; Lawrence, $5,744.54; Lebanon, $5,074.22; McKean, $3,957.02; Mifflin, $2,472.24; Montgomery, $10,191.69; Union, $3,070.48; Washington, $14,984.81.

Asphaltic Pavements and Stone Roads with Bituminous Surface Treatments

(Concluded from Page 172)

bituminous surface treatments and give them the day to day attention that they require and you will find that most of them can be kept in good condition for an amount per square yard per year that is less than the cost of carrying the investment and sinking fund charges and the maintenance costs of a more modern type of pavement.

And encourage all the propaganda you possibly can to emphasize the importance of upkeep. If you have a road that will not stand up under the traffic it has to carry, don't do as they do in some places—let it go until you can lay a new pavement—but keep the road up to the last moment, making upkeep and the theory of "a stitch in time" 75% of your work and the other 25% will take care of itself.

ooo

The Missouri Federation of Women's Clubs has decided to support the $60,000,000 state road bond issue which will be voted upon at the fall election.

The Texas Company about two months ago opened an oil well at West Columbia, Texas, which has produced 26,000 bbl. a day without any falling off of pressure or output, and it is thought that its total yield may amount to 6,000,000 bbl. If this estimate is correct, the value of the yield of the well will total $18,000,000.

HIGHWAY TRANSPORTATION

Motor Trucks Lower Food Costs

Motor trucks are fast becoming the most important connecting link between the producer and consumer of food. The shortage of help on the farm, the alarming drift from farm to factory, is bringing the motor truck to the attention of those who are engaged in farm work, for the truck is aiding in production and decreasing labor. Both the farmer and the consumer share in the advantages arising from the use of motor trucks in transporting the products of the land to market, the farmer securing decreased production costs and the consumer decreased living costs.

ACME TRUCK HAULING LOAD OF POTATOES TO MARKET AT JOHNSTOWN, PA.

The accompanying illustration shows a 2-ton Acme motor truck loaded with 115 bu. of potatoes coming into Johnstown, Pa. The load was brought 35 mi. over rough and rocky roads, a feat that would have required two teams at least and would have required more than a day for each team. This load was brought to market in a little over three hours.

Motor Transport Clearing Houses Are Established Throughout England

Entire Country Linked Together in Plan To Secure Return Loads and Reduce Costs

The Automobile Association and Motor Union of England will shortly put into operation a system of clearing houses for motor transport which will link up the entire country, according to "Municipal Engineering and the Sanitary Record," London. About 600 agents have been appointed in various sections who will act as clearing house officials in registering the requirements of local manufacturers and merchants so as to secure return loads for motor trucks and steam wagons. Under the new plan all existing power haulage organizations have become associated in their work and the system will be extended to every quarter. The scheme will be worked out in conjunction with the existing clearing houses forming the Association of Road Transport Clearing Houses.

During the war some of the important centers, such as Leeds, Liverpool and Manchester, were linked up for motor transport and a number of those associations are still maintained under local organizations. The Industrial Vehicle Section of the Automobile Association has issued a map of Great Britain showing all the towns having a clearing house agent who keeps registers of road transport requirements, their names and addresses being given on a special list prepared by the association.

Motor Truck Line Opens in Pittsburgh

Motor transportation of freight to points within a radius of 75 mi. of Pittsburgh, Pa., is being carried on by the Rainbow Lines, Inc., organized by and a subsidiary of the Union Transportation Lines, of Louisville, Ky. The trucks are operated on regular schedules and freight is carried at published tariff rates. The first trips were made on Oct. 1.

Trucks Save Money for Ice Cream Firm

The Hydrox Ice Cream Co., of Chicago, Ill., has a fleet of 24 motor trucks to deliver its products and keeps complete cost records of the work of the trucks. Two years ago the company did not use trucks and the cost of delivering a gallon of ice cream was $.0506, which has been reduced to $.0322 by the use of trucks. Thus is this company enabled to save $20,000 per year and serve its customers with greater ease and satisfaction.

The number of automobiles in Canada in 1919 was 341,396, practically five times the number in 1914.

The Trailer Manufacturers' Association, which was organized in 1919 with 14 charter members, has now a membership of 23 trailer manufacturers.

A farmemr near Colorado Springs, Col., raised 25,000 lb. of beans this season and by means of four motor trucks took the entire crop to market 40 mi. distant.

The Central New York Motor Transport Lines, Inc., is now operating among 40 towns around Syracuse, besides having terminals at Watertown, Oswego, Utica and Geneva. The longest run is between Ithaca and Syracuse, a distance of about 65 mi. The firm has eight trucks, all of which are equipped with pneumatic tires.

EQUIPMENT—TRADE—MATERIALS

Highways in the Panama Canal Zone

Not content with building the Panama Canal for commercial purposes, the United States is proceeding with plans to make the Canal Zone a place of beauty also. Not only have the cities and towns been laid out to accommodate present-day traffic needs, but foresight has been used in planning wide streets with decorative grass plots along the highways, spacious lawns and abundant shrubbery around the private houses and government buildings.

One of the outstanding features of the Government's policy is the construction of smooth, durable, hard-surfaced roads to accommodate present and future traffic demands. The accompanying ilustration shows an asphaltic concrete pavement on the streets of Pedro Miguel, C. Z. This illustration also gives one an idea of the systematic scheme of city planning in this territory.

MAIN ST., PEDRO MIGUEL, CANAL ZONE; TEXACO ASPHALTIC CONCRETE PAVEMENT

A system of improved highways is being constructed which will connect all the towns of the Canal Zone.

Dorman Wave Power Tools

An illustrated catalog describing the Dorman rock drills, jackhammers and other equipment has recently been issued. This equipment is designed to be used as pneumatic equipment is now used, the transmission of energy being effected by means of water instead of compressed air. The method employed, however, differs somewhat from that of the transmission of energy by hydraulic means, in that there is no continuous flow, the particlles of the liquid pulsating backward and forward. It is maintained that the use of water has several distinct advantages over compressed air.

W. H. Dorman & Co., Ltd., Stratford,, Eng., are the sole British licensees and manufacturers of the Dorman wave power tools.

Labor Saving Machinery in India

Coolies comprise the larger part of road laborers in India. A road engineer in one of the cities of India thought that he would expedite the work of his gang by importing a number of wheelbarrows. He explained the use of the device and distributed the wheelbarrows. Coming back to the job a short time afterwards he was astonished to find that the coolies were carrying the wheelbarrows loaded with material.

Fire at the Maurer Plant of the Barber Asphalt Paving Company

Blaze Sweeps Over Entire Six Acres of Plant, Belching Forth Molten Asphalt and Dense Smoke, Causing Million Dollar Loss

The Maurer, N. J., plant of the Barber Asphalt Paving Co. was partly destroyed by fire on Sept. 26, the loss being estimated at from $1,000,000 to $2,000,000. The fire started shortly after midnight, Sept. 25, and continued burning until late in the afternoon of the next day.

Several tank cars filled with asphaltic material burst because of the intense heat and masses of burning material were hurled in all directions. Several fireboats and firemen and apparatus from Perth Amboy, Woodbridge, Elizabeth, Rahway and New York City succeeded in keeping the fire confined to the Barber plant, preventing its spread to nearby plants and dwelling houses. The stable of the Henry Maurer & Sons Brick Co. caught fire and was destroyed.

The heat of the fire was very intense and the smoke became so heavy and dense that the firemen were obliged to use searchlights in the middle of the day. Clouds of smoke swpet for miles over the central part of New Jersey and Staten Island, and the pungent fumes of the fire were observed in Newark and Elizabeth. Until the heat and smoke became unbearable, scores of Barber employees labored in trying to salvage some of the stocks of asphalt, but the bursting of several cars of the material put an end to this work.

The following statement concerning the fire and its origin was issued by the company:

"A serious fire at the plant of the Barber Asphalt Paving Co. at Maurer, N. J., occurred on Sunday, Sept. 26, originating about 2:00 a. m. in one of the tanks used for storing heavy petroleum residue:

"Owing to the nature of the fire, it is as yet impossible to accurately determine the extent of the damage, but the following important units of the plant are not involved:

"The plant utilized for manufacturing asphalt cements for use as road binders, etc.; the laboratory and experimental plants; the office building, the docks, bulkheads and ship discharging facilities, and the barrel manufacturing plant.

"The fire was confined to the lower end of that portion of the plant lying east of the New Jersey Central Railroad tracks. The extensive oil refining plant of the company lying west of these tracks and at a considerable distance from the damaged plant is not involved in any way.

"The fire risk on the damaged portion of the plant is amply covered by insurance, including buildings, structures, contents and stocks. The officers of the company now believe that the main power plant is only partially damaged and can be put into operation within a few weeks. Meanwhile, electric power can be obtained from adjoining properties to insure constant operation of the piers and ship discharging facilities. Only a small part of the rolling stock is affected. There will be no interference with the importation and shipment of barreled asphalt for street paving purposes, and within two weeks the company expects to be able to resume shipment of asphalt cements for street paving, road building and roofing purposes.

"Apparently the plant utilized for the manufacture of roofings, saturated flooring felts and similar water-proofing materials is the most seriously damaged, but it is anticipated that most of the damage is confined to the buildings and structures and that the foundations and machinery are in such condition as to be susceptible of repair and operation within 90 days.

"A more complete statement will be issued as soon as the full extent of the damage is more definitely ascertained."

MEETINGS

Calendar of Coming Meetings

Oct. 6-8.—League of Kansas Municipalities.—Annual convention, McPherson, Kan. Secretary, Albert A. Long, University of Kansas, Lawrence, Kan.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Nov. 8-12.—League of California Municipalities.—Annual convention, Chico, Cal. Executive secretary. W. J. Locke, Pacific Bldg., San Francisco, Cal.

Nov. 15-17.—City Managers' Association.—Annual convention, Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York, N. Y.

American Society for Municipal Improvements

The twenty-sixth annual convention of the American Society for Municipal Improvements will be held at the Planters Hotel, St. Louis, Mo., on Oct. 12, 13, 14 and 15. The convention will be formally opened at 11 a. m. on Tuesday, Oct. 12, but there will be a preliminary joint meeting of the Executive Committee and the Finance Committee on Monday afternoon, and on Tuesday forenoon there will be meetings of the Committees on Specifications for Bituminous Macadam, Bituminous Concrete and Asphalt Block Pavements; Brick Pavements; Stone Block Pavements; Sheet Asphalt Pavements; Cement Concrete Pavements; Wood Block Pavements; Broken Stone and Gravel Roads; Sidewalks and Curbs; and Foundations for Pavements.

Among the committee reports and papers of interest to highways engineers that are to be presented during the convention are the following:

Tuesday forenoon: Report of the Committee on Street Cleaning, Refuse Disposal and Snow Removal, Chairman A. F. Macallum, Commissioner of Public Works, Ottawa, Ont.; "Methods of Snow Disposal," by H. S. Richards, Maintenance and Repair Division, South Park Commissioners, Chicago, Ill.

Tuesday afternoon: Report of Committee on Street Lighting, Chairman, C. W. Koiner, City Controller of Pasadena, Cal.; "Street Illumination," by Hugo Wurdack, President, National Light and Development Co., St. Louis, Mo.; "Street Lighting in St. Louis," by Ralph Toensfeldt, Engineer, Department of Public Utilities, St. Louis, Mo.; "Street Lighting and Traffic Accidents," by Ward Harrison, Illuminating Engineer, National Lamp Works, Cleveland, O.; "Municipal Finance," by Louis Nolte, City Controller, St. Louis, Mo.

Wednesday afternoon: Report of the Committee on City Planning, Chairman, Harland Bartholomew, Engineer, City Plan Commission, St. Louis, Mo.; "The St. Louis City Plan," by E. R. Kinsey, President, Board of Public Service, St. Louis, Mo.; "The Zoning Plan Recently Adopted for Washington, D. C.," by Harland Bartholomew, Engineer, City Plan Commission, St. Louis, Mo.; "Pittsburgh Problems in City Planning, Due to Rugged Topography" (illustrated), by N. S. Sprague, Chief Engineer, Bureau of Engineering, Pittsburgh, Pa.; "Highways for Traffic in Town and Country," by Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York, N. Y.; "The Construction of Municipal Bridges and Buildings in St. Louis," by L. R. Bowen, Engineer of Bridges and Buildings, St. Louis, Mo.; "Suggestions from European Practice in Municipal Improvements" (illustrated), by George B. Ford, Director, City Planning Department, Technical Advisory Corporation, New York, N. Y.; "The Relation of Zoning to the Work of the City Engineer," by E. S. Rankin, Engineer, Bureau of Sewers, Newark, N. J.

Thursday morning: Report of the Committee on Street Paving, Sidewalk and Street Design, Chairman, William A. Howell, Engineer in Charge, Bureau of Streets, Newark, N. J.; "Producing and Refining of Asphalt" (illustrated), by Herbert Spencer, Engineer, Standard Oil Company of New Jersey; "Asphaltic Pavement Construction on Illinois State Highway and Chicago Boulevard Link" (Illustrated), by John B. Hittell, District Engineer, Asphalt Associatiotion, Chicago, Ill.; "The Elimination of Unnecessary Testing from Asphalt Specifications," by R. R. Barrett, Engineer, the Texas Company, New York, N. Y.; "Asphalt Block Pavements," by P. L. Thompson, Hastings Pavement Co., New York, N. Y.; "The Present Status of Macadam Base for Bituminous Pavements," by Julius Adler, Technical Engineer, Atlantic Refining Co., Philadelphia, Pa.; "Wood Block Paving," by Herman Von Schrenk, Consulting Engineer, St. Louis, Mo.; "Concrete for Municipal Paving," by Col. H. C. Boyden, Portland Cement Association, Chicago, Ill.; "Paving Brick and Brick Pavements, Special Features," by J. C. Travilla, Consulting Engineer, St. Louis, Mo.; "Brick vs. Block for City Street Paving," by S. Cameron Corson, Borough Engineer, Norristown, Pa.; "Gravel, A Plea for Common-Sense Specifications," by Wallace F. Purrington, Chemist and Testing Engineer, New Hampshire State Highway Department; "Specifications and Tests for Road Gravel," by F. H. Jackson, Testing Engineer, U. S. Bureau of Public Roads; "The Protection of Gravel Roads by Surface Treatments," by Philip P. Sharples, Manager, General Tarvia Departmemnt, the Barrett Co., New York, N. Y.

Thursday afternoon: Reports of Committees on Specifications as follows: Sheet Asphalt Pavements, Chairman, R. Keith Compton; Bituminous Macadam, Bituminous Concrete and Asphalt Block Pavements, Chairman, Linn White; Broken Stone and Gravel Roads, with or without Bituminous Surface Treatment, Chairman, F. A. Reimer; Brick Pavements, Chairman, E. H. Christ; Cement Concrete Pavements, Chairman, E. R. Conant; Stone Block Pavements, Chairman, H. H. Smith; Wood Block Pavements, Chairman, E. R. Dutton; Sidewalks and Curbs, Chairman, S. Sammelman; Foundations for Pavements, (special committee), Chairman, R. K. Compton, ex officio.

Friday morning: Report of the Committee on Traffic and Transportation, Chairman, Arthur H. Blanchard; "Relations of the Proposed Uniform Vehicle Law to Municipal Traffic Regulations," by H. G. Shirley, Secretary, Federal Highway Council; "Pavement Foundations as a Factor in Economic Transportation," by R. C. Barnett, Consulting Engineer, Kansas City, Mo.; "Width of Roadways for Different Classes of Streets," by Robert Hoffman, Commissioner, Division of Engineering and Construction, Department of Public Service, Cleveland, O.; Report of Committee on Standard Tests for Bituminous Materials, Chairman, A. H. Blanchard.

Besides the papers listed, there will be round table discussions at lunch on Tuesday, Thursday and Friday, and possibly at breakfast each morning after Tuesday. On Wednesday afternoon there will be an automobile trip through some of the most interesting sections of St. Louis, and on Friday afternoon there will be a special boat trip along the northern water front of that city.

Among the entertainment features scheduled are the following: A golf tournament on Monday afternoon, a reception at the Planters Hotel on Tuesday evening, a smoker and entertainment by the Engineers' Cub of St. Louis on Thursday evening and theater parties and other entertainments for ladies at the convention.

The Transportation Committee of the Federal Highway Council held a meeting at Akron, O., on Sept. 26 and 27.

The Arkansas-Louisiana Tourists' Way Association met in Monroe, La., on Sept. 24 to formulate plans for the promotion of a paved highway from Little Rock to Alexandria, by way of Monroe. This proposed highway will connect with the Pelican Highway to Lake Charles and the Jefferson Highway to New Orleans.

PERSONAL MENTION

Creston O. Cooke has been appointed acting road superintendent of Allegheny County, Pennsylvania.

William E. Hurley has been appointed county superintendent of highways of Center County, Pennsylvania.

OBITUARY

Thomas M. Schenk, District Engineer for the Public Works Department of Canada at Halifax, died on Sept. 4 at Montreal.

Edward A. Wilmot, civil engineer in the employ of the British Columbia Government, and at one time city engineer of Victoria, B. C., recently died at the age of 75 years.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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AMERICAN HIGHWAY ENGINEERS' HANDBOOK
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GOOD ROADS

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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
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JAMESTOWN. N. Y., OCTOBER 13, 1920

Number
14

Highway Work in Illinois

During September 49 Miles are Completed on Federal Aid System and State Bends all Energies to Complete Remaining 225 Miles Under Contract—$2,881,504 Bridge and Grading Contracts Let

During the month of September approximately 49 mi. of highways were completed in Illinois, bringing the total construction of hard-surfaced roads for this year to 203 mi. This mileage is distributed as follows:

Lincoln Highway, 38 mi.; Dixie Highway, 35; National Old Trail, 49; Chicago-St. Louis Road, 72; Chicago-Waukegan Road, 1; State Aid Work, 8.

Uncompleted contracts on the above roads amount to approximately 225 mi.

A general rain over the central and southern part of Illinois during the latter part of September shut down many jobs, thereby decreasing the mileage which would have been completed on the National Old Trails and the Springfield-St. Louis Roads. Also, the work continues to be delayed by shortage of railroad transportation. A number of special permits have been issued by the Interstate Commerce Commission for the movement of highway materials to certain points in the northern part of the state and in the vicinity of St. Louis. As a result, considerable material has been moved on the Lincoln Highway, but in the vicinity of St. Louis, cars have not been made available by the issuing of the permits. In addition, there has been a marked shortage of labor on the Springfield-St. Louis Road, which has not permitted the equipment to work at full capacity.

During the month of September the Division of Highways awarded contracts for approximately 20 mi. of grading, involving $380,144. Contracts for 15 bridges have also been awarded, involving an expenditure of $476,025. All of this grading and bridge construction is situated on the state bond

INDUSTRIAL RAILWAY AND CONCRETE MIXING PLANT IN OPERATION ON AN ILLINOIS ROAD JOB

FINISHING AND TAMPING THE CONCRETE ON ILLINOIS PAVING WORK issue system. Since July 7, 1920, the date of the first letting of this class of work, contracts have been let for $2,881,504 worth of grading and bridge construction.

Under the state aid law, $4,800,000 has been appropriated for highway construction since 1913, and the counties have added approximately $4,150,711 to the state allotment during this period. Roads and bridges have been built in every county of the state from the proceeds.

The types and mileages constructed with this fund are: Brick, concrete, or bituminous concrete on cement concrete foundation, 624 mi.; macadam and gravel roads, 84; earth roads, 481.

In addition, 537 bridges have been built at a cost of $440,737, this number not including the bridges constructed in connection with road improvement.

The total funds for federal aid work from all sources, which have been or are available, amount to $15,524,072, of which $9,635,964 has been expended on federal aid roads. The total mileage built with these funds amounts to 368 mi., and in addition, there are 268 mi. under contract but not completed. In addition to this uncompleted mileage are the grading and bridge contracts awarded since July 7.

Since 1911 there has been collected in motor fees, $17,196,024, the revenue from this source having increased from $105,344.28 in 1911, to $1,587,772.69 in 1917, $2,762,567.53 in 1918, $3,262,176.57 in 1919 and $5,724,492.80 in 1920.

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The Motor Truck in Road Work

A road builder returning from a recent European trip related witnessing the building of the first concrete road in Spain and said that the materials were brought to the mixer in baskets carried by hand. To substantiate his statement, he displayed photographs of the work which showed a number of men charging the mixer with materials from baskets. To road builders in America such methods undoubtedly seem primitive, yet if we recall early road building practice in this country, we find that not so many years ago our own methods were primitive—at least in comparison with road building methods of today. The industrial railway, the motor truck and the concrete mixer perform the work formerly done by the mule, the wheelbarrow and the shovel.

One of the chief factors in the development of road building is the motor truck, which not only accelerates the transportation of materials but reduces the cost, thus going far towards solving some of the chief of the road builder's problems. Not only has the motor truck proven of value under normal road building conditions, but it has often been the means of averting failure when contractors have faced abnormal situations. A deficiency of labor or equipment can often be remedied to a large degree by the more speedy delivery of materials, and a shortage of material may often be overcome by sending larger numbers of trucks to more distant sources of supply. Because of its flexibility to meet the various problems of the road builder and its ability to deliver materials at the time and the place wanted, the motor truck has grown to be an important factor in road building work.

In the selection of a motor truck, particular attention should be given to selecting the right body for the work to which the truck will be put. In construction, trucks with dump bodies are largely used, while in maintenance work trucks having the apex bottom with side gates are frequently employed. By getting the body best adapted to the work, the loading and unloading time is cut down to a minimum, thus increasing the efficiency of the truck and reducing operating costs to a very appreciable degree.

Because sand and gravel are used in large quantities in road work, these materials are are usually handled by a 3½ or 5-ton truck of the dump body type. Very often on some jobs it is advantageous to use a side-dump body. Crushed stone is handled in a similar manner. When it is desired to spread the stone on the road, trucks with adjustable tailboards are used. These can be reguated so as to spread the stone while the truck is in motion, and some road builders report that they are able to spread courses of large and fine stone in one operation by placing the fine material on top of the coarse material in the truck. Very often a stone spreader is attached to the truck to obtain still more uniform distribution.

In addition to its function of carrying materials, the motor truck is used extensively to take the place of horses and mules in drawing road scrapers, drags and scarifiers. Graders which require six or eight horses are often pulled easily by a heavy truck and the work is done in less time.

The motor truck has rapidly found favor as a part of the equipment in building concrete roads. The aggregate may be hauled considerable distances and dumped directly into the skip of the mixer. By the use of mechanical mixers or elevated storage bins no time is lost in loading or unloading and a considerable saving in labor is effected. Some contractors divide their truck bodies into several compartments, filling them with the various aggregates required for the correct mix.

Although paving brick is usually transported in trucks with dump bodies, a demountable body is on the market which reduces the time of loading and unloading and lessens the breakage. One body is loaded while the other is being delivered, thus eliminating the idle time of both truck and laborers.

One of the important uses of the motor truck in road work is in the application of bituminous materials to the road surface. Motor-driven distributors are much superior to horse-drawn machines since the trucks can go back and forth to the base of supply in much less time, and also the pressure can be more readily regulated and kept uniform. Accordingly, a uniform quantity of bituminous material is applied to the road and waste is averted.

Bituminous paving mixtures are handled to advantage by the motor truck and can be discharged and spread while the truck is in motion. Since the action of hot bituminous materials has a destructive effect upon steel bodies, there have been designed special dump bodies having an asbestos packing between the inner steel lining and the outer body. Asphalt, being a material which has a tendency to stick to the sides of the body while being dumped, bodies are made especially to handle this material, being wider at the rear.

For the handling of bridge and other long materials, truck bodies may be purchased with a narrow cab so that structural materials up to 25 ft. in length may be loaded so as to project up beyond the cab and the length of the truck body may be used for carrying smaller materials. For hauling curbing and heavy pieces of materials, such as are used in bridges, trucks are made with platform body and overhead crane equipment. The service departments of the various truck manufacturers are glad to cooperate with road builders in the selection of equipment and the planning of efficient operation of motor trucks on specific jobs.

Careful records of operating costs should be kept by contractors utilizing motor trucks in road work. Not only must the motor trucks be adapted to the work, but they must be so operated that operating costs are reduced to the minimum. Truck makers realize the need for such records and have devised cost systems that can be secured by truck owners.

Notes on the Operation of Patrol Maintenance in Wisconsin[*]

Success or Failure Rests Largely Upon the Individual Patrolman—Proper Supervision by County Officials Necessary — Results Secured in 1919—Bonus System—Personnel

The success or failure of patrol maintenance rests to a great degree upon the individual patrolman. If he is intelligent, conscientious, honest, a good worker, and follows rigidly the instructions given him, he will make a thorough success of his section.

If each county highway commissioner insists upon each and every patrolman giving value received, knows when a patrolman has done a day's or a week's work; visits him often enough to know that the work is done at the proper time and in the proper manner, and is not afraid to fire one who is not making good, he will make a thorough success of the work in his county.

Representatives of the commission must visit the several counties often enough to know whether or not the maintenance work is being performed properly and adequately. If a county becomes negligent or allows the patrolmen to become lax, the commission must have backbone enough to step in and take charge of the maintaenance work under the provisions of Subsection 4 of Section 1317 of the statutes, or the state system will not be a success.

state system will not be a success.

Five hundred and sixty-one patrolmen were employed on the system. During the season of 1919, 54 changes were made. Each patrolman was given a rating at the close of the season, based upon the improvement made in his section, rather than upon the actual condition of the section. One hundred and forty-five were classed as excellent, 207 as good, 130 as fair, 85 as poor. Those in the excellent and good classes, or 62%, have really made good, and are being employed for the 1920 season. Those in the fair class, or 25%, have possibilities, if coached properly; but those in the poor class, or 15%, will not be employed another season. On the whole, we believe the patrolmen have done wonderfully well. Many of them had no previous experience in road construction and maintenance, and we find that invariably they want more instruction and advice from the county highway commissioner and the commission than it is possible to give.

We believe the bonus system put in operation in 1919 has brought enough results to warrant using the same plan for 1920. Of the 561 patrolmen employed during 1919, 429 received a bonus of $5 per month for each month that they were in the employ of the county and 132 patrolmen did not receive a bonus, due to the fact that their work was not satisfactory.

The division engineers determine who shall receive the bonus, and their decision is arrived at by checking over the condition of the patrolman's section at the time each visit is made during the entire season, taking into consideration the traffic and condition of the road when taken over by the patrolman.

The majority of patrolmen are between the ages of 35 and 55 years. The majority are also farmers or retired farmers. We have, however, many retired merchants and professional men, as well as one or two preachers. We know at least one patrolman worth no less than $75,000 and many that are rated from $25,000 to $30,000. In the majority of cases, this class is making good. They made a success of their own busines and are now making a success of the public's business.

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[*] Etract from "Highway Maintenance," Bulletin No. 11, Wisconsin Highway Commission.

The Fourth International Road Congress

Road Builders Should Urge this Country to Join Permanent International Association—Individuals may Secure Life Membership for $10

By **ARTHUR H. BLANCHARD***

The First International Road Congress was held in Paris in 1908. At this congress, the Permanent International Association of Road Congresses was formed with headquarters in Paris. The Second Congress was held in Brussels in 1910.

The Third International Road Congress was held in London in 1913, at which time there were 3,793 members of the association. The business sessions of the congress occupied about one week and were devoted to a thorough discussion of the subject matter of 123 reports pertaining to the 19 topics on the program of the congress. During the final business session, progressive conclusions relative to each topic were adopted by the Congress. The Government of the United States was the only world power which was not a member of the association when the Third Congress was held. The records of the Third Congress indicate that the following important countries were members of the association; Austria, Belgium, France, Germany, Great Britain, Italy, Japan, Norway, Portugal, Russia, Spain, Sweden, and Switzerland. Of the smaller countries, it is interesting to note that our neighbors, Cuba and Mexico, sent government delegates to the London Congress and are Government Members of the association.

The International Commission of the Permanent International Association of Road Congresses, at its meeting held in Paris on June 21, 1920, unanimously voted to accept an invitation to hold the Fourth International Road Congress in the United States in 1922, provided an invitation from the United States Government is received by the Executive Committee of the association before Jan. 1, 1921. If an invitation is not received from the United States on or before Dec. 31, 1920, the invitation from the Italian Government will be accepted. As a regulation of the association stipulates that an international congress cannot be held in a country whose government is not a permanent member of the association, it will be necessary for the United States Congress, during November or December, 1920, to pass an appropriation which will provide for the annual subsidy of the United States as a government member of the association and which will enable the Secretary of State to extend an official invitation to the association to hold the Fourth International Road Congress in the United States in 1922.

The object of the association is to promote progress in the improvement of highways and the efficiency of highway transport throughout the world. The work of the association consists in organizing international road congresses, publishing reports, papers, proceedings and other documents and collecting information relative to highway improvement and highway transportation.

The membership of the association consists of representatives of governments, delegates of corporations and individual or private members. The business affairs of the association are managed by the Permanent International Commission, which is composed of members representing the various governments having membership in the association. Each government has the right to one representative for each 1,000 francs of its total annual subsidy, provided, however, that the number of representatives from any one government does not exceed 15.

Individual or private members pay annual dues of 10 francs, or compound for a life subscription by the payment of one sum of 125 francs. Due to the current rate of foreign exchange, it is practicable for Americans to become life members by the payment of the subscription of 125 francs through the medium of a bank draft, which will cost, at the present time, between $9.50 and $10.00. Life membership dues should not be sent by an International Postal Money Order, as an order for 125 francs will cost approximately $25.00. Bank drafts should be made payable to the Permanent International Association of Road Congresses and be sent to Professor Paul LeGavrian, General Secretary, Permanent International Association of Road Congresses, 1 Avenue d'Iena, Paris, France.

Individual members receive, free of charge, all of the publications of the association, including papers, reports, and proceedings of congresses, which, in times of peace, are held triennially. The reports and proceedings of the Third International Road Congress, measure, when stacked, about 6½x9½ in. by 8 in. in height. The reports contain reliable information pertaining to the progress in highway development and highway transportation in all important countries and hence serve as an encyclopedia of foreign practice. Members also receive the "Bulletin" of the association, each issue consisting of 40 to 50 pages devoted to official notices, minutes of meetings of the International Commission and the Executive Committee, and reviews relative to highway improvement and highway transport in different countries. All the literature, sent to American members, is printed in English.

The international association should be supported by Americans who wish to see the science and art of

(Concluded on Page 184)

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*Professor of Highway Engineering and Highway Transport, University of Michigan, Ann Arbor, Mich.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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AN INTERNATIONAL ROAD CONGRESS IN THE UNITED STATES

Previous to the beginning of the Great War three international road congresses had been held, one at Paris, one at Brussels and one at London. The Permanent International Association of Road Congresses had been formed and had become a going concern and work had been commenced on plans for a fourth congress at Munich in 1916.

Memberships in the Permanent International Association of Road Congresses are held by nations and by individuals. Practically all the world powers are members—or were at the outbreak of the War. The United States, however, has never taken the necessary steps to become a member, though this country has been well represented at each congress by a number of leading highway engineers and officials.

The Fourth International Road Congress will be held in 1922 and it has been proposed that it be held in the United States. It can not be, however, unless the Government becomes a member. The steps necessary to this end and the desirability of such action are discussed at length by Arthur H. Blanchard, Professor of Highway Engineering and Highway Transport at the University of Michigan, in a statement printed on other pages of this issue.

As Prof. Blanchard intimates, American engineers attending the international congresses have felt keenly the failure of their country to participate officially. Just why this country has never become a member is not evident. Certainly it can not have been a matter of money, for the membership fee is only a trifling sum. Nor does it seem likely that this Government's attitude is a matter of sentiment.

If the nation becomes a member of the association the necessary action will have to be taken by Congress before the end of this year. Highway engineers who desire their country to take the action it ought to take, should use whatever influence they can bring to bear to have the matter taken up and acted upon favorably.

THE PERSONAL EQUATION IN PATROL MAINTENANCE WORK

"The success or failure of patrol maintenance rests to a great degree upon the individual patrolman. If he is intelligent, conscientious, honest, a good worker, and follows rigidly the instructions given him, he will make a thorough success of his section."

The foregoing is the opening paragraph of an article printed on another page of this issue. It is taken from a bulletin on maintenance issued by the Wisconsin Highway Commission and it sums up in a few words the qualities that bring success in all road work—and, for that matter, in every kind of work. Possessing those qualities, a worker can succeed at almost any ordinary task; without them he can not achieve real success, though he may contrive to appear successful.

Though indispensable to the worker's success in any occupation, intelligence, conscientiousness, honesty and the ability and willingness to follow instructions are absolutely essential to the success of the work itself in the maintenance of roads by the patrol system. The patrolman's job is one in which the success of the worker and the success of the work are inseparable. If the work is poorly done, if the results are not what they should be, the man who does the work has to be written down a failure—assuming always, of course, that the task imposed is not an unreasonable one. On the other hand, good results on the road necessarily mean that the worker has succeeded.

The nature of the patrolman's work demands the qualifications that have been listed. Whatever he accomplishes is his own accomplishment more than in most similar jobs. He has no helpers and no ever-present superior. Working alone, he must be conscientious if he is to do all that he should and do it in the manner he should. His work, though manual, is skilled labor that calls for more than average intelligence. Honesty is obviously required, for his work can not be checked up in detail and ordinarily he is entrusted with equipment and sometimes with money. He has to be a good worker, for his labors are not light and he is given an amount of work that is known to be about all that he can handle. He must be able and ready to follow closely the instructions given him, because generally he comes to the work without any knowledge of it and, not infrequently, without training that fits him for it.

All things considered, patrolmen should be workmen considerably above the average. That they actually do measure up to that specification is evidenced by the personnel of the patrol force of Wisconsin.

California Contractor Wins Lawsuit

A recent decision by Judge T. N. Harvey of Bakersfield, Cal., involving two claims of A. H. Vaughn, a San Francisco contractor, growing out of contracts for paving county highways in Tulare County, California, was handed down against the county. Final payment for the paving was withheld by the supervisors, who maintained that the concrete laid did not conform to the specifications, which called for a 4-in. thickness of concrete. The court decided that the specifications had been complied with and the case was dismissed.

The other claim of the contractor was for $6,893 for extra excavation. The court allowed 2,890.8 yd. at 85 ct. per yard, amounting to $2,457.

The Fourth International Road Congress

(Concluded from Page 182)

highway improvement and highway transport rapidly develop throughout the world, who believe in an international medium for the exchange of opinions and conclusions, and who wish to be well informed relative to progress in highway engineering and transportation in foreign countries. Americans should not be satisfied with joining the association as individual members. Although every courtesy was extended to the United States members of the association at Paris, Brussels and London, nevertheless every American who has attended an international road congress has wished to apologize because his government was not a permanent member of the association. Considering the phenomenal development of highway improvement and highway transport in the United States, and the active part which the United States Government is taking in highway construction through the medium of the Federal Aid Act, it requires no elaborate arguments to demonstrate the advisability of the United States Government becoming a permanent member of the association. The status of the United States as a leading world power demands that its annual subsidy should be the maximum allowed by the constitution of the association, that is, 15,000 francs, which will provide for 15 representatives of the United States on the Permanent International Commission. It is the duty of every American, who wishes to support the work of the international association and to have an international road congress held in the United States in 1922 to write to his representatives in Congress urging them to vote favorably on an appropriation to provide for the annual subsidy of the United States as a Government Member of the Permanent International Association of Road Congresses.

Peace Portal of Pacific Highway Association Nears Completion

Ceremonies Will be Held in Dedicating Memorial and Formally Opening Highway

The formal opening of the Pacific Highway, extending from British Columbia to the Mexican border, and the dedication of the Peace Portal, now being erected on the Canadian border to commemorate the signing of the Treaty of Ghent between Great Britain and the United States, have been postponed indefinitely. The Peace Portal is being built on the Canadian boundary line near Blaine, Wash., and is expected to be completed in a short time. This is the first portal ever erected to commemorate peace along an unfortified boundary line.

It had been planned to hold the ceremonies at the Peace Portal on Oct. 20, but the Canadian Government has ordered an election on that date, thus preventing the people of Canada attending the exercises at that time. Accordingly, Samuel Hill, President of the Pacific Highway Association, has announced that although the portal is expected to be completed in a short time, the dedication ceremonies necessarily have been postponed.

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Fort Smith, Ark., claims to be the best paved city in the country. It has a population of 28,800 and has 82.75 mi. of paved streets.

The National Association of Gardeners has started a movement to create public sentiment for the removal of billboards from country highways.

The State of Illinois collected $13,303,096 in motor fees from Jan. 8, 1917 to Aug. 17, 1920. In the four years immediately preceding this period, the total collected amounted to $3,372,010.

Farmers of Kern County, California, are agitating a movement for better roads and at a recent farm center meeting a resolution was passed favoring a general road tax of 10 ct. upon each $100 property valuation.

China Will Build Wide Roads

Hsu Shih Chang, President of the Republic of China, has issued an executive order providing for the building of good roads in that country. Roads connecting Peking with the capitals of the various provinces will be at least five channy (55 ft.) wide. Roads connecting the capital of a province with district seats are required to be at least three channy (33 ft.) wide, and roads between district seats are to be not less than 2½ channy (27½ ft.) in width.

Highway Fatalities in New York State

Motor vehicles caused the death of 202 persons in the State of New York during the month of September, according to the report of the National Highway Protective Society. The report further says that the death record for September is the greatest in the history of the state and exceeds by 100 the number killed in the corresponding month of 1919.

In New York City, 89 persons were killed by automobiles in September, 49 of this number being children under the age of 16. In the state, 13 occupants of automobiles were killed.

$18,000,000 Needed for Repairing and Constructing New Jersey Bridges

State Highway Commission Urges Governor Edwards to Secure Legislation for Bond Issue to Meet Serious Bridge Situation

Declaring that $18,000,000 must eventually be spent on the construction and repair of bridge structures on the New Jersey state highway system and that $6,000,000 of this amount must be spent in the next three years, the New Jersey State Highway Commission on Oct. 4 submitted a statement to Governor Edwards, urging him to recommend to the Legislature of 1921 that bonds be issued to cover the cost of these necessary improvements. The proposed bond issue, it was suggested, would be subject to a referendum vote of the people.

Seven bridges in need of urgent repair were cited, including the structure spanning the Raritan River at Perth Amboy, which carries a large part of the traffic between New York and Philadelphia. This bridge was closed temporarily last summer for repairs. One bridge in Morris County has partly collapsed and fallen into the stream. These structures will cost about $4,245,000 to replace and about $315,000 must be spent for immediate repair if they are to be kept open to traffic.

The commission further asserted that 200 of the 600 bridges embraced in the state highway system are in need of temporary repair, for which $940,000 is required. Allowing $500,000 for incidental and unforeseen repairs, $6,000,000 is needed for immediate repair work. To bring al lthe bridges in the state highway system up to the established standard, a further $12,000,000 will be required, making a total of $18,000,000 required for bridge work in the state.

Many Manufacturers of Passenger Automobiles Reduce Prices

Ford Starts Price Reduction Movement and Others Follow—Few Changes in Truck Prices

More than a dozen manufacturers of passenger automobiles have reduced the price of motor cars and it is thought probable that other manufacturers will do likewise. The Ford Motor Co., of Detroit, Mich., made the first reduction and in less than a week after it was announced a number of other manufacturers made material cuts in prices. It is interesting to know in connection with the sudden changes made by some makers, that from one factory which makes a well-known car, an advance of $100 on all models had been agreed upon a month previous, to take effect Sept. 27. The increase did take effect, but two days later, on Sept. 29, a reduction of $200 was ordered, making the price $100 less than the old one.

As a means of letting prospective buyers know just where the various factories stand on the price question, many manufacturers have issued positive announcements that no immediate changes might be expected.

So far the price reduction movement has not greatly affected motor trucks.

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Orange County, California, spends $167.80 per mile in maintaining its system of paved highways, according to J. L. McBride, County Engineer.

Both Houses of the New Jersey Legislature concurred in passing a bill increasing the motor vehicle license fees 20% in order to provide additional funds for road maintenance purposes.

The Women of Port Clinton, O., recently celebrated a tag day at Catawba Island, selling tags to all automobilists who crossed the island, the proceeds of which, amounting to $369, will be used in improving the roads of the town.

Pennsylvania Has Built 200 mi. of Highways this season, according to a recent report of Lewis S. Sadler, State Highway Commissioner. In addition, 56 mi. of subgrade were reported finished and awaiting the laying of the pavement.

The Somerset County, New Jersey, Good Roads Association is being formed and over 100 members have so far been enrolled. The organizers are George M. Lamont, of Bound Brook; J. M. Stryker of Bernardsville; and John Crimm, Irving Hoagland, H. K. Gaston, George A. Post and Carl Hoagland, of Somerville.

EQUIPMENT—TRADE—MATERIALS

Air Drill of a New Type

The development of pneumatic mining and quarrying tools has been so rapid, and their performance latterly so efficient, that it is but natural they should now be regarded as having reached such a state of perfection that radical changes or improvements are, generally speaking, no longer expected. Notwithstanding this popular notion, a new type of light mining and quarrying drill which, it is claimed, marks an advance in the progress of air drill manufacture that has seldom, if ever, been equalled by any single achievement, has recently been put on the market.

NEW AIR DRILL

This new type of drill is built in three models, known respectively as Models NA-90, NRW-93 and NRD-95; the first named being a "dry" auger drill, especially designed for work in coal, iron and other soft formations; the second, a combination "wet" and "dry" rock drill efficiently serviceable in all kinds of rock and under all conditions, either above or below ground; and the last named, a "dry" rock drill particularly adapted to work in wet shafts or where out-of-door conditions prevail.

All three drills are extremely light, so that they can be easily carried about, and each is operated by one man alone. They are built throughout of the very best steels compounded, and with the utmost precision. While most Waugh drills are of the valveless type, the "nineties" are equipped with an entirely new type of positive action spool valve, which, it is claimed, adds both simplicity and efficiency.

The rotation mechanism is of an exceptionally strong design in which the stresses in both teeth and pawls are reduced to a minimum. Lubrication is effected by pulsations of air which gradually feed the oil from a reservoir at the side of the cylinder into all parts of the machine.

These drills are manufactured by the Denver Rock Drill Manufacturing Co., of Denver, Colo.

"Compressed Air for the Road Builder"

An attractive and instructive booklet of 24 pages bearing the above title has recently been issued by the Ingersoll-Rand Co., New York, N. Y. In the first part of the book the various uses of compressed air in road building are considered, accompanied by many illustrations showing the practical application f compressed air. In the back of the booklet the Ingersoll-Rand line of compressed air equipment for the road builder is described and illustrated.

"Caterpillar" Theater Formally Opened

At the annual convention of the Illinois Association of Highway Commissioners and Town Clerks, held in Peoria, Ill., on Sept. 22 and 23, a special feature was added to the program. On the afternoon of Sept. 22, the convention adjourned at 2:30 and the delegates traveled in special interurban cars to the plant of the Holt Manufacturing Co., in East Peoria, where they were the guests of the company at the dedication of the new "Caterpillar Theater."

The new road film, "Caterpillar and Good Roads," was exhibited. These pictures show various operations in road building, featuring the Caterpillar tractor in clearing the right of way, grading and hauling materials. After the motion pictures, the guests were given a smoker, after which they were taken to the Peoria Fair Grounds to visit the National Implement and Vehicle Show.

Specifications for Asphalt Pavements

Asphalt Association Announces List of Printed Specifications for Distribution

The Asphalt Association, 25 West 43d St., New York, N. Y., has ready for circulation in printed form a number of typical specifications prepared by its Technical Committee, composed of highway engineers and specialists. In the preparation of these specifications special attention has been paid to form and arrangement with the idea of making them definite, concise and free from ambiguities. The printed specifications are on single fold sheets of the size adopted by the U. S. Bureau of Public Roads, most of the state highway commissions and many municipalities. Those now ready are as follows:

A-1, Asphalt macadam surface course; A-2, asphaltic concrete surface course (coarse graded aggregate type); A-3, asphaltic concrete surface course ((fine graded aggregate type); A-4, sheet asphalt binder and surface courses; B-7, asphaltic base (asphalt macadam type).

A limited number of the following specifications in mimeographed form may also be obtained upon request:

A-5, asphaltic concrete binder and surface courses; B-1, gravel base; B-2, macadam base; B-3, reconstruction of old macadam to serve as base course; B-4, Telford base; B-5, Portland cement concrete base; B-6, trueing up old pavements to serve as base course; C-1, preparation of subgrade; C-2, sub-base; C-3, shoulders, headers, curbs and gutters.

Specifications for asphaltic base (asphaltic concrete type) will be available for distribution in the near future.

During the preparation of these specifications the committee had before it the specifications of every state highway department in the United States, as well as those of a large number of the principal counties and cities, and of the U. S. Bureau of Public Roads. The opinions of many prominent highway engineers were obtained and digested. The committee, with Prevost Hubbard, formerly Chief of the Division of Tests and Research of the U. S. Bureau of Public Roads, as chairman, was composed of engineers having long practical experience upon highway and pavement construction and design. In order to make them applicable to varying conditions throughout the United States, each printed specification is accompanied by a notice to engineers which will assist the engineer in modifying it, if necessary to meet his particular requirements.

A few of the fundamental features of the specifications are as follows:

A-1, Asphalt Macadam Surface Course: A minimum thickness of 2½ in. utilizing a coarse aggregate of 1½ to 2½-in. crushed stone and asphalt cement of from 80 to 150 penetration are recommended. The limits of penetration of the asphalt cement are to be specified by the engineer within a 10-point range if below 90 and within a 30-point range if over 90 penetration.

A-2, Asphaltic Concrete Surface Course (coarse graded aggregate type): A finished thickness of 2 in. asphaltic concrete composed of coarse aggregate 95% of which will pass a 1¼-in. screen, fine aggregate, 4 to 6% of filler, and 5 to 8% of asphalt of from 50 to 70 penetration (10-point range fixed by engineer) are the outstanding features.

A-3, Asphaltic Concrete Surface Course (fine graded aggregate): A finished thickness of 2 in., with coarse aggregate 95% of which passes a ½-in. screen, sand, 7 to 11% of filler, and 7.5 to 9.5% of asphalt with a penetration of 50 to 70 (10-point range fixed by engineer) are recommended.

A-4, Sheet Asphalt Binder and Surface Course: Binder and surface courses each having a thickness of 1 ½in., binder course to have 60 to 80% coarse aggregate, sand, and 4 to 6% of bitumen, the asphalt cement for both courses to have a penetration of from 30 to 60 with a 10-point range fixed by engineer. The surface course mixture is as follows:

Passing	10-mesh,	retained	on	40-mesh —	10	to	40%
"	40-mesh,	"	on	80-mesh —	22	to	45%
"	80-mesh,	"	on	200-mesh —	12	to	30%
"	200-mesh,				10	to	20%
Bitumen					9.5	to	12%

B-7, Asphalt base (asphalt macadam type): To consist of two courses; the first to have a thickness of 3½ in. and the second 2½ in.; coarse aggregate for the first course to consist of 2½ to 3½-in. stone and for the second course 1¼ to 2½-in. stone; asphalt cement to have penetration of from 80 to 150 (fixed within a 10-point range if less than 90 and a 30-point range if over 90, by engineer); one application of asphalt at the rate of 1.25 to 1.5 gal. per square yard to be made upon each course, and the second course covered with a thin layer of ¾ to 1¼-in. stone.

A-5, Asphaltic Concrete Binder and Surface Courses: This specification provides for a 1½-in. course of fine graded aggregate asphaltic concrete wearing course as specified under A-3, laid over a 1½-in. binder course as specified under A-4.

B-1, Gravel Base: To consist of two courses each not less than 4 in. in thickness after compaction; 95% of the gravel to pass 3½-in. screen and 50 to 75% to be retained upon a ¼-in. screen.

B-2, Macadam Base: To consist of two filled courses each not less than 3 in. in thickness, 95 to 100% of the crushed stone to pass a 3½-in. and 0 to 15% a 2½-in. screen, 95 to 100% of the screenings to pass a ¾ or ½-in. screen and 40 to 80% a ¼-in. screen.

B-3, Reconstruction of Old Macadam to Serve as Base Course: Provides for reconstruction of old macadam in order to secure a minimum thickness of 6 in. after compaction.

B-4, Telford Base: Provides for hand laid 8-in. Telford base.

B-5, Portland Cement Concrete Base: A mixture in the proportions of 1:3:6 with a thickness of 6 in. is specified.

B-6, Trueing up Old Pavements to Serve as Base Course: Provides for trueing up old pavements by the use of an asphaltic concrete mixture in preparation for the application of an asphaltic wearing course.

C-1, Preparation of Subgrade (no explanation required).

C-2, Sub-base: Provides for a sub-base of field stone filled with smaller fragments and compacted.

C-3, Shoulders, Headers, Curbs and Gutters: Provides for gravel, water-bound and asphalt macadam shoulders, and Portland cement concrete headers, curbs and gutters.

Specifications for Lubricants

The difficulties in the way of consumers and producers of lubricating oils are discussed at some length in an article by Wm. F. Parish, of the Sinclair Rfining Co., entitled "Development of Oil Specifications," appearing in the September number of the "National Gas Engine." There is much confusion in the drawing of such specifications, according to the author, and often there is also a wide difference of opinion as to the type of lubricant required for a given machine. Not a little of the trouble is due to the failure to standardize testing machines, laboratory methods and nomenclature. Mr. Parish briefly describes the specifications used by the Government during the war, citing them as examples of the possibility of drawing specifications rigid enough to obtain suitable lubricants, yet broad enough to admit a wide variety of products.

MEETINGS

Calendar of Coming Meetings

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Nov. 8-12.—League of California Municipalities.—Annual convention, Chico, Cal. Executive secretary. W. J. Locke, Pacific Bldg., San Francisco, Cal.

Nov. 15-17.—City Managers' Association.—Annual convention, Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York, N. Y.

American Association of Engineers

The American Association of Engineers will hold a conference on employment and education in the Congress Hotel, Chicago, Ill., on Nov. 12. General and group meetings will be held and various educational and employment questions will be considered.

New Jersey Highway Officials

A conference of New Jersey highway officials and contractors was held Sept. 28 in Trenton for the purpose of preparing a united protest before the Public Utility Commission against the increase requested by the railroads on shipments of gravel, sand and other road materials.

Federal Highway Council

The Federal Highway Council held a transportation conference on Sept. 27 and 28 at Akron, O. Highway officials and representatives of the motor industry, the railroads and express companies were in attendance.

C. M. Upham, State Highway Engineer of Delaware, Vice Chairman of the Committee on Subgrade, outlined the work of this committee and its importance to highway development. The personnel of the committee is as follows: Coleman du Pont, Chairman; C. M. Upham, Vice Chairman; A. T. Goldbeck, U. S. Bureau of Public Roads; D. A. Abrams, Chair of Engineering, Lewis Institute, Chicago, Ill.; F. H. Eno, Chair of Engineering, Ohio State University; D. S. Humphrey, Ohio State Advisory Board; L. A. Nares, Fresno, Cal.; H. W. Alden, Society of Automotive Engineers; Paul D. Sargent, President, American Association of State Highway Officials; H. G. Shirley, Secretary, Federal Highway Council; C. J. Tilden, Chair of Engineering, Yale University, and W. P. Blair, Vice President, National Paving Brick Manufacturers' Association, Cleveland, O.

An educational committee under the chairmanship of W. E. Blodgett, of Philaldelphia, Pa., was formed to cooperate with the Educational Bureau.

Charles Hine, of New York City, spoke of the relation of the railroads to the country; F. S. Holbrook, Vice President of the American Railway Express, pledged the cooperation of the interests he represented.

"Virginia's New Hour," a photoplay made under the direction of the Educational Bureau of the Federal Highway Council to promote good road interest in Virginia, was shown at one of the local theaters. More than 2,000 Virginians take part in this picture.

Meetings of a similar character will be held at other centers where the production of highway rolling stock is a leading industry.

PERSONAL MENTION

Ray V. Warren has resigned as county road commissioner of Allegheny County, Pennsylvania.

Frank Bidewell has been appointed executive secretary to Thomas J. Wasser, State Highway Engineer of New Jersey.

R. D. Schooley, Secretary and Chief Examiner of the Pittsburgh Municipal Civil Service Commission, has succeeded Ray V. Warren as county road commissioner of Allegheny County, Pennsylvania.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912 OF "GOOD ROADS," published weekly at Jamestown, N. Y., for Oct. 1, 1920.

State of New York, County of New York, ss:

Before me, a Commissioner of Deeds in and for the State and county aforesaid, personally appeared E. L. Powers, who, having been duly sworn according to law, deposes and says that he is the Editor and Business Manager of "Good Roads," and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation,) etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

Publisher—The E. L. Powers Co. (Inc.), 11 Waverly Place, New York, N. .Y
Editor—E. L. Powers, 11 Waverly Place, New York, N. Y.
Managing Editor—T. A. Hulbert, Jamestown, N. Y.
Business Manager—E. L. Powers, 11 Waverly Place, New York, N. Y.

2. That the owners are:

The E. L. Powers Co., (Inc.), 11 Waverly Place, New York, N. Y.
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C. J. O'Brien, Treasurer, 11 Waverly Place, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed. through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is: (This information is required from daily publications only.)

E. L. POWERS, Editor & Bus. Mgr.

Sworn to and subscribed before me this 5th day of October, 1920.
(Seal) O. D. CONKLIN,
Commissioner of Deeds, N. Y. C.
(My commission expires June 15, 1922.)

188a—

GOOD ROADS

CONSTRUCTION · TRANSPORTATION MAINTENANCE

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New Series, Vol. XX October 20, 1920 16

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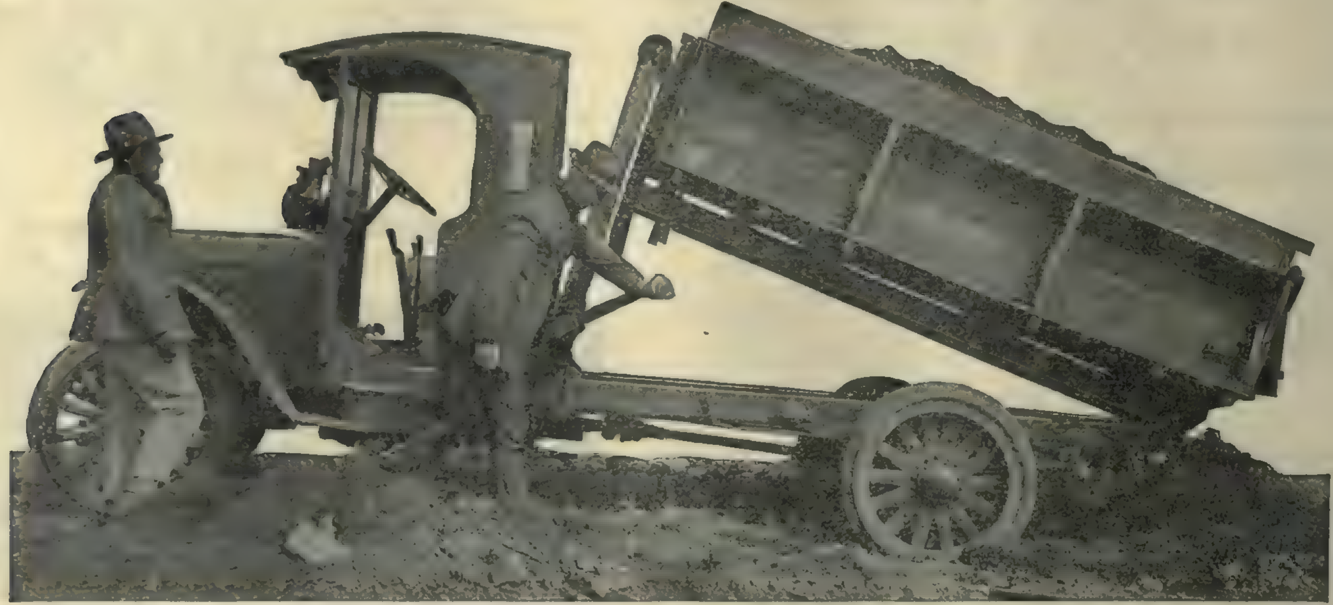

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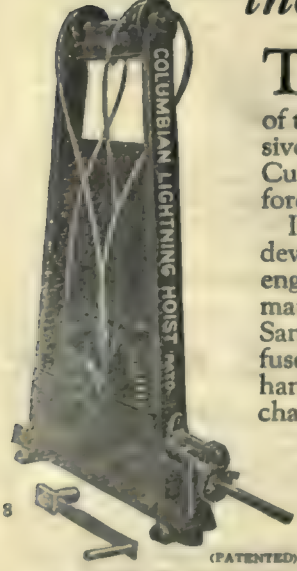

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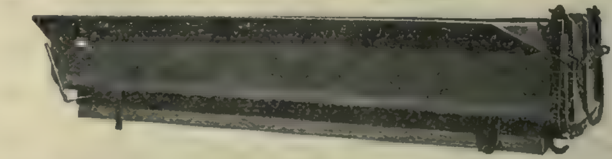

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX

JAMESTOWN, N. Y., OCTOBER 20, 1920

Number
16

The Protection of Gravel Roads by Surface Treatment*

By PHILIP P. SHARPLES†

The importance of the gravel road problem is realized when the figures for federal aid projects are analyzed. For the years 1917, 1918 and 1919 27.67% of the projects called for gravel roads, an amount exceeded only by the mileage of earth roads.

Wherever good road building gravels are available, the gravel road is the logical step between an earth road and a macadam type of road. Its usefulness depends on the gravels available, the method of using them, the care taken in providing drainage, climatic conditions, traffic, and above all, maintenance.

During the past few years attempts have been made to utilize the bituminous materials used so successfully in macadam road maintenance in surface treating gravel roads. Naturally, much of the success of these treatments has depended on the gravel roads chosen for the experiment. As in the early days of macadam treatment, the attempt has been made to save gravel roads so disintegrated that a surface treatment could be of little use, or to treat roads which were gravel only in name and not in fact.

Needless to say, a surface treatment cannot supply drainage, a foundation, or modify poor construction. Its only office is to protect by a surface skin the structure that lies beneath. If the skin cannot be supported, the road cannot be maintained by surface treatments.

CEDAR SPRINGS ROAD, MUSKEGON COUNTY, MICHIGAN—GRAVEL ROAD TREATED WITH TARVIA B (2 APPLICATIONS, ¼ GALLON EACH) IN THE SPRING OF 1916

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*From a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Manager, General Tarvia Department, The Barrett Co.

Except in certain localities like New England and parts of Texas, and scattered points in other states where a fund of practical experience has been accumulated, the bituminous treatment of gravel roads may be said to be in the experimental stage.

The importance of surface treatments is everywhere realized. A gravel road, well built of good materials and sufficiently wide to handle the traffic, can take care of 200 vehicles per day without undue stress, if it is well maintained by the patrol system with an intelligent use of the road scraper and road drag. With an increase in the intensity of traffic, the dust nuisance becomes intolerable and the road develops pot-holes faster than the patrolmen can fill them up.

The surface treatment, if it can be successfully worked, seems to hold out the only hope of holding the gravel road under increased traffic. When the cost of replacing the gravel road with some higher type is considered, it will be found that a very considerable annual sum can be expended on a gravel road and yet be less than the amount necessary to reconstruct it. According to the type considered, the interest on the new construction, the depreciation, and the upkeep will yield a fund of $2,000 to $4,500, which could well be expended yearly on the gravel road rather than to replace it.

As long as a gravel road is giving reasonable satisfaction with good dragging and patrol maintenance, it should not be surface treated, since maintenance by surface treatment is more expensive up to a traffic congestion that warrants its use.

Surface treatments should never be attempted unless provision is made beforehand to insure proper patrol or gang maintenance. Their economy and success depend on proper daily care of the road. It is less expensive to let the gravel road go to pieces in the first place than to surface treat it and then let it go to pieces.

The application of bitumen on gravel may be divided into three groups: Application of dust laying oils, formation of a bituminous mat, and formation of a bituminous crust.

The application of dust laying oils may be resorted to on any type of gravel road. Subsequently, the road is maintained by the ordinary dragging and patrol methods. It must be remembered, however, that the oil destroys the natural bonding quality of gravel and in wet weather the oil forms an objectionable, greasy mud.

The second method, the formation of a mat or carpet coat with heavy bitumens, either tar or asphalts, is rarely successful, since the mat is not thoroughly supported by the gravel surface and quickly breaks under traffic and scales off.

The third method, of forming a bituminous crust which does not form a separate layer, but is anchored firmly into the gravel, has given the greatest success. In this work the refined tars used cold have been especially valuable. They penetrate into the gravels easily and harden just sufficiently under traffic to make the process successful. A material that does not harden, eventually produces a wavy surface. Such a surface treatment can only be successful on a road capable of sustaining the crust under the traffic conditions imposed. Needless to say it must be built of good gravel, well drained, of proper strength and of a width adequate for the traffic. Treatments on one track roads are not advisable. If they are adequate for the traffic, they do not need surface treatment. If they are not adequate, they should be widened. * * * * * *

The refined tars applied cold have given good results on high class gravel roads, when intelligently applied and when proper maintenance is given. Gravel is not a uniform material and unless the breaks that occur are taken care of, the treatments are neither economical nor successful. The cost will be more than the usual patrol maintenance costs, but the cost of the refined tar is offset to some extent by the elimination of dragging and the saving of wear on the gravel, thus necessitating less frequent renewals. Roads in hilly country are protected from washing, with a direct saving and economy after flooding rains.

The gravel roads are prepared for the treatment by shaping and dragging during the spring. If new gravel is added, it should not exceed a depth of 2 in. and should be added as early in the spring as possible. Heavy additions of gravel should be made in the fall, and new gravel roads should not be treated until they have weathered a winter and been carefully reshaped in the spring.

The road should be treated in the spring as soon as it is firm and solid. In New Hampshire and Maine, the roads are usually ready about the middle of May, but there is considerable seasonal variation.

Sweeping is usually but not always necessary. Only the dust should be removed and care should be taken not to loosen the gravel.

The refined tar is put on cold, or only warmed slightly to 100° or 120° F. The best results are obtained by mechanical sprayers putting on two coats, the first of 0.4 gal. This is allowed to dry in without cover, which usually takes 6 to 24 hours in dry, sunny weather. The second coat of 0.3 gal. follows. If this is not quickly absorbed, it is covered with just enough coarse, sharp sand or fine gravel to prevent the bitumen from sticking on the vehicle wheels.

After the work is completed, the road should be given careful patrol maintenance. Breaks will develop over soft spots in the gravel, and these must be patched with a mixture of gravel and refined tar. The patrolman should be supplied with 4 to 10 bbl. of refined tar per mile at convenient spots for this work. As soon as the first batch of weak spots has

(Concluded on Page 194)

Gravel; A Plea for Common Sense Specifications*

By **WALLACE T. PURRINGTON**†

In preparing specifications for gravel to be used in road work, certain objects must be kept in mind, the most important being making the specifications workable. A specification based merely on laboratory tests may be very impracticable, because the deposit from which the samples were obtained was not homogeneous or because the samples tested do not represent any large part of the deposit. It must also be remembered that the specifications may work well or not, according to whether or not the purchaser has the equipment or technical knowledge to check up the composition of the material.

Most present specifications for gravel seem very ambiguous and wholly impracticable. Many states use screened gravel, but in New Hampshire where there are many miles of very good gravel roads, screening has not been found necessary, for with proper supervision of the manipulation, run of bank gravel gives as good results as does screened material. In screening, two sizes of materials are obtained, the larger being called gravel or coarse aggregate and the finer designated as sand or fine aggregate. It is common to attempt to specify limits for the ratio of gravel to sand in order to secure a material that is neither too fine or too cobbly. This might be very satisfactory if deposits were generally uniform and homogeneous in texture. This is not the case since the deposits most abundant and accessible in the northern states are of glacial origin and are notably heterogeneous in structure and texture. An inspection of almost any gravel bank in New Hampshire will illustrate this condition and demonstrate the futility of judging a deposit from a single sample or from many samples.

Good results are more likely to be gained by making the texture and grading matters for field inspection by the engineer and leaving to the laboratory only the testing for resistance to wear. Assuming that the material is composed of hard, durable stones, the overworked phrase "such as will meet the approval of the engineer," can well be used, as it means more in the proper construction of gravel roads than any theoretical grading system that may be adopted.

In New England and the northern states generally, the material usually found in gravel pavements is of three kinds—gravel, sand, and till, the last commonly designated as hard-pan, and roads should be designated as "sand-gravel," "till-gravel," or "sand-till-gravel," according to the proportions of these materials found in them. The choice of the type to build will depend largely upon the material in the subgrade. The state, being the purchaser, may well specify whether clay, till or sand shall be used as a binder, and may also well say that the base course shall be of gravel with the larger stones predominating, and that in the wearing course much smaller stones shall predominate. A statement of this sort can be understood by all interested and is far more intelligible than an attempt to specify by percentages passing given screens.

The soundness and durability of stone is of considerable importance and can be specified within limits by means of the Rea modification of the Deval abrasion test.

The outstanding facts in reference to gravel specifications may be summarized as follows:

1. The greatly increased demand for good roads cannot be met everywhere by adopting the heavier and more costly types of construction. Local materials must still very generally be used in building gravel and earth roads. Since the screening of gravel is quite costly, it may well be eliminated as its efficiency is open to question.
2. Specifications for gravel roads must be plain and straight-forward. So far as grading is concerned, the specifications must be based upon what a reliable engineer can see at the pit where the deposit is fully exposed, and not based upon laboratory screening tests on a sample or several samples from a deposit that varies greatly in texture.
3. In order to secure sound, durable stones. tests by the Rea-Deval method should be specified.
4. The character of the fine aggregate, or the matrix, should be left to the engineer's judgment.
5. A little theory mixed with a lot of common sense is better than the reverse.

With these points in mind and after extensive field and laboratory surveys of gravels, the New Hampshire State Highway Department has adopted the following specifications:

Materials for Gravel Pavement

Gravel is to be understood to be a water-laid, stratified deposit which consists of rolled and rounded stones accompanied by sand and clay in varying proportions. The stones (or coarse aggregate) shall be hard and sound and well assorted, in sizes up to but not exceeding three and one half (3½) inches in long diameter. The resistance to wear shall be determined by the modified abrasion test described in Bulletin 555, page 30, of the U. S. Department of Agriculture, Office of Public Roads; and the gravel thus tested shall be classified as follows:

Class A, Hard gravel under 7% wear.
Class B, Medium hard gravel from 7 to 10% wear.
Class C, Medium soft gravel from 10 to 15% wear.
Class D, Soft gravel above 15% wear.

(Continued on Page 194)

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*Abstract of a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Chemist and Testing Engineer, New Hampshire State Highway Department.

Asphalt Production, Refining and Related Problems*

By **HERBERT SPENCER**†

Nearly every one is familiar with the processes involved in the preparation of most of the materials used in pavement construction, but little has been written on the production and refining of the asphalt cement used in paving work. The object of this paper is to describe briefly the production, transportation and refining of the oil from which asphalt is made, together with some of the problems of shipping the finished product and handling at the asphalt plant. As Mexican asphalt has been used extensively in the East, the paper will be confined largely to this material, although what is said will be applicable to most asphalts used in pavements.

Because of the increasing use of Mexican asphalt, the continuation of the supply from Mexican fields will largely influence the present road and street program. Although conditions in Mexico are far from settled, the field is still in operation and does not appear to be seriously affected by the large quantities of oil which have been drawn from it. In some sections, particularly in northern Vera Cruz, part of the oil produced has been rendered unfit for use by the infiltration of salt water that has affected a horizontal plane covering a wide area. This has resulted in the extinction of many of the large producing wells, but prospecting in adjacent fields indicates a steady increase in the production of Mexican oil.

The main factors in the use of Mexican oil, based upon present conditions in Mexico, are: (1), prices; (2), pipe line facilities; and (3), transportation.

The export tax on Mexican oils is so heavy that a large part of the value of crude oil at the wells is collected by the Mexican Government. The building of pipe lines from the fields to the Gulf has facilitated the movement of the crude oil, and increased pipe line facilities will add materially to the quantity available for transportation to the United States.

At the close of the war, the number of tank steamers available for bringing Mexican oil to this country was limited. But tankers now under construction will be placed in service as rapidly as possible and it is expected that these will aid materially in increasing the quantity brought in. Tankers vary in capacity from 60,000 to 115,000 bbl., and make the trip from Mexico to Atlantic ports in about eight days. They are equipped with powerful pumps and can be loaded and unloaded in about 48 hours. In some cases the oil is loaded directly from the well to the tanker, the pressure at the well being sufficient to force the oil through the pipe lines and into the steamer.

Upon reaching the refinery, the oil is transferred to the storage tanks, from which it is discharged to the stills which are generally arranged in batteries. The oil is reduced at a temperature of about 600° F. The operation takes about 60 hours, the correct temperature being maintained until the material reaches the desired penetration. Overheating or too rapid distillation affects some of the essential characteristics of asphaltic cement, such as ductility and susceptibility to climatic changes. Mistakes seldom occur, as careful tests are made and the still-men become very proficient.

The causes of failure of asphaltic wearing surfaces are estimated by Wallace L. Caldwell, of the Pittsburgh Testing Laboratory, to be as follows: Unsuitable mineral aggregate, 30%; improper manipulation at the mixing plant, 25%; poor workmanship on the street, 15%; bad weather conditions. 15%; bitumen of improper consistency, 10%; and bitumen unsuitable for paving, 5%. The larger cities generally lay a heavy traffic mix and a light traffic mix, and in addition there is a great demand for an asphalt for bituminous concrete. These three grades cover the bulk of the material used for the heavier forms of asphalt construction, the penetrations most commonly used being 35-45, 45-55 and 55-65. Meeting these requirements imposes no hardship on the refiner, but when subdivisions of these grades are called for, it necessitates additional storage and materially affects the running of regular grades. At present refiners are asked to make asphalts of penetrations of 35-40, 40-45, 45-50, 50-55, 55-60, 60-65 and 65-70, and in some cases are asked to run the material to a definite penetration. Discrepancies in the penetration tests made by different operators leave much to be desired, and unnecessary grades inflict hardship on the refiner by forcing him to keep so many stocks when probably not more than three grades would be sufficient to meet all requirements.

After the asphalt has been reduced to the proper consistency, it is pumped to tank cars or storage tanks. Tank cars are loaded from an overhead rack, while barrels or drums are filled from storage tanks by means of hand nozzles, after they have eben coated with a lining of clay or a similar material to keep the asphalt from sticking. Tank cars range from 6,500 to 10,000 gal. in capacity, and are equipped with steam coils capable of heating the material so that it can be pumped in from 6 to 10 hours.

(Concluded on Page 195)

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*Abstract of a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Engineer, Standard Oil Co. of N. J., New York, N. Y.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Editor

T. A. HULBERT
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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

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Vol. XX OCTOBER 20, 1920 No. 16

ASPHALT STORAGE FACILITIES

Prices and deliveries of materials have been among the chief troubles of road builders during the season now drawing to a close. The results have been curtailment of work, delays and costs that have been almost prohibitive in many instances.

For the most part these conditions have been due to causes quite beyond the control of consumers, but one way in which contractors and others can speed up deliveries and eventually effect some reductions in cost is pointed out in a paper presented at the recent convention of the American Society for Municipal Improvements held at St. Louis last week. The paper was presented by Herbert Spencer, of the Standard Oil Company of New Jersey, and an abstract of it is printed elsewhere in this issue.

A survey of conditions disclosed the fact that many consumers of asphalt are without storage facilities and are utilizing the tank cars of the producers for that purpose, according to Mr. Spencer. One of the results of this practice, naturally, is undue delay in emptying cars. This leads to a shortage and holds up shipments from refineries. It also somewhat increases the cost of work by the addition of demurrage charges.

It is understood that not all contractors can install storage tanks. At the same time many who have no such facilities could readily provide them, with an ultimate profit to themselves. More prompt unloading of cars could also be managed in many cases, even when there were no storage facilities.

Cities using any considerable quantities of asphalt certainly should provide storage of their own. They are under none of the handicaps imposed upon contractors working in many different and often widely separated localities.

TOO GREAT REFINEMENTS IN ROAD BUILDING SPECIFICATIONS

Progress in road building has been measured very largely by the advances made in the science of highway engineering in which improvements in testing methods and in the application of the results of tests have been important factors. At the same time, there is a possibility that some things may have been carried too far, that needless refinements have been introduced into highway engineering practice.

This possibility is suggested in two of the papers presented at the American Society for Municipal Improvements convention at St. Louis last week. In the paper by Herbert Spencer, to which reference is made elsewhere on this page ,the author protests against what he holds to be unnecessarily narrow limits in the specifications of penetration ranges, and in a paper by W. F. Purrington, Testing Engineer of the New Hampshire State Highway Department, a plea is made for less involved gravel specifications. Abstracts of both of these papers are printed on other pages of this issue. Another paper along the same lines, "The Elimination of Unnecessary Testing from Asphalt Specifications," by R. R. Barrett, of the Texas Co., was also presented at the meeting.

While every effort should be made to reduce highway engineering to as nearly as possible an exact science, it should be evident that there is a point beyond which it will not pay to go. No highway engineer with any appreciation of values would ask for a profile of an unimproved dirt road plotted to hundredths of a foot. It is equally futile to require too exact penetration values in specifying asphalts or too narrow screen limits in specifying gravel. There are significant figures in analyses just as there are in other measurements.

———ooo———

The Missouri Good Roads Federation is carrying on an active campaign for the passage of the proposed $60,000,000 state bond issue at the November election. Literature telling of the benefits arising from good roads has been distributed throughout the state and many good roads meetings have been held to stimulate interest.

The Protection of Gravel Roads by Surface Treatment

(Concluded from Page 190)

been eliminated, a good gravel road requires comparatively little attention even under heavy traffic. The trunk highway between Portsmouth and Portland carries 2,000 to 3,000 vehicles per day on this construction.

The treatment usually carries a road through the winter, but whether it breaks up during the spring depends upon the road construction, the traffic and the weather conditions. After a hard, snowy winter, the road is not likely to break, but after a soft, open winter it is very likely to act like an ordinary gravel road.

If it does not break up, it is given a further treatment of about .25 gal. per square yard, and this usually requires cover of sharp sand, or small gravel, using about 1 cu. yd. to 300 sq. yd. of area.

If the road breaks up, it is treated like any other gravel road, shaped up and dragged back into shape. The time when this can be done is short, and it is necessary to work quickly. If the road once hardens, ordinary road machines have little effect on the surface.

The reshaped road is then retreated. Usually ¼ to 1/3 gal. per square yard will be found sufficient to restore the surface, and carry it through the season.

Roads that do not in themselves break up may, after a few seasons, become rough through frost displacement or through poor maintenance. A road becoming rough should be broken up in the spring. The road roller with a steam scarifier is an efficient tool for this purpose. After breaking, the road is harrowed back into shape and re-rolled. It is then given a treatment of refined tar and treated like the road that has broken naturally. The refined tar in the road sticks the gravel together in chunks to some extent, and the road often is smoother and wears better than ever before.

The cost of breaking up is not excessive and in Maine was under $200 per mile for an 18-ft. road, previous to the war.

The scheme which has been outlined for extending the usefulness of gravel roads must not be misunderstood. It does not produce roads which are capable of standing the traffic of higher class roads. They are not adapted to heavy, all-the-year-round traffic, but they are adapted to a light winter traffic and during the summer will stand up under heavy touring traffic.

Where heavy winter and spring traffic exists, this type of road will not answer, and macadam, bituminous macadam, or even a more expensive type, will prove more economical.

If, however, the gravel road can be made to stand the traffic by an expenditure of even $1,000 to $1,200 per mile per year, it is justifiable, rather than to build a higher type at prevailing prices and high interest rates. A $20,000 per mile type costs yearly in the neighborhood of $2,500 for interest, depreciation and upkeep, and a $40,000 per mile type may be rated at $4,500 per year for the same charges. From these figures, road engineers are justified in giving close study to the problems of the cheaper class of roads. Our road propagandist has made many an engineer forget that even under the most favorable conditions the gravel road mileage built is going to exceed for years to come that of any other type of surfaced road.

Gravel; A Plea for Common Sense Specifications

(Continued from Page 191)

Classes A and B may be used for either or both base or surface course. Class C will not be used for surface course and gravel of D quality will not be used except by written permission of the Commissioner.

The texture (coarseness or fineness) of the aggregate from any source or supply of gravel shall be such that it shall meet the written approval of the Commissioner. No gravel shall be used until a complete report has been made by the Engineer regarding its qualities, and the approval of the Commissioner has been obtained specifying the class of work for which its use is approved. The approval shall be furnished on a form which shall contain the following information:

1. Account to which work is to be charged..........................
(Town)

2. Nature of material, gravel, sandy gravel, sand, till, clay.

3. Source of material ....
(Local name) (Location)

4. Type of material, gravel, gravel-till, gravel-clay, sand-clay.

5. Contractor or Foreman ....
(Name) (Address)

6. Grading of pit (Visual inspection) (Check the description which best fits the case.)
   (a) Uniform and well graded, large stones predominating.
   (b) Uniform and well graded, small stones predominating.
   (c) Streaky or poorly graded, coarse aggregate predominating.
   (d) Streaky or poorly graded, fine aggregate predominating.
   (e) Sandy with only a small amount of coarse aggregate.
   (f) Cobbly with only a small amount of fine aggregate.

7. The Laboratory has reported on a sample submitted from this source under Laboratory Number.......................... to be ....% of wear and is rated as Class...................... gravel.

....
Engineer.

This is satisfactory material and may be used in the base, surface course.

....
Commissioner

By..

These blanks shall be executed in quadruplicate, one copy to be furnished the contractor, one copy to the Office of Public Roads, one copy to the Commissioner and one copy to be retained by the Engineer.

It is understood that the Engineer may order the Contractor to cease operation in any pit when in his judgment the size of aggregate is not suitable for the type of road construction under consideration.

Asphalt Production, Refining, and Related Problems

(Concluded from Page 192)

The economy of asphalt work is largely influenced by the containers used for shipping and storage. Causes entirely beyond the refiners' control at times bring about conditions that make shipments uncertain. The Mexican asphalt supply depends upon the Mexican oil supply; deliveries to refineries depend upon ocean transportation; and deliveries to consumers depend upon railroad conditions and a mobile tank car service. Shortages or delays in equipment and strikes or embargoes affect the delivery of the material to consumers, and the present unsettled condition of all markets has caused delays unknown under normal conditions.

Adequate storage facilities at points of delivery are of the utmost importance to the refiner in the matter of prompt shipment. Increased paving work has resulted in the use of tank cars to a much greater extent than smaller containers, because of the savings effected, which, assuming asphalt at $33 per ton, delivered, and a loss of 5% in material left in the package, amounts to $10.40 per ton, divided as follows: extra cost of package, $8.00; 5% loss, $1.65; difference in labor of handling, $.75. This is partly offset by interest and depreciation charges on storage installation, but, aside from the direct saving, adequate storage facilities at an asphalt plant involve an indirect saving from a number of factors, including the absence of demurrage charges, the prompt return of tank cars thus insuring continued shipments, no shut-downs due to delayed shipments, and others.

A survey of the practice of contractors shows a decided shortage of storage facilities and has revealed the fact that consumers utilize tank cars for storage purposes. While this may be economical for the contractors, it creates a situation decidedly serious for the trade in general by delaying the return of tank cars and so decreasing the number available. As a rule, municipal asphalt plants are equipped with storage facilities, as are large contractors doing work in cities. The greatest trouble is experienced with contractors having isolated jobs in outlying districts and in the smaller cities, where the yardages are small and the contractor feels that storage is not economical for him.

The more permanent storage installations call for either steel or concrete tanks. Enough asphalt to last at least one week should be kept on hand, and if possible, a reserve stock should be kept in barrels or drums. Because of the difficulty of securing sufficient capacity for a plant from one tank car, it seems necessary to provide storage that can be set up at each location and salvaged for the next job. A storage tank of this type consists of a large circular steel tank, in the middle of which is a heating chamber equipped with steam coils. The shell of the heating chamber is bottomless, so that asphalt from the outlet tank is free to enter it. It does this when the tank is in operation, new asphalt constantly flowing in from the outer tank to replace that drawn from the heating chamber. The tank is shipped knocked down in five sections and can be moved from one location to another by unbolting the steel sheets and packing them together. It is set up in a pit prepared to allow for the sloping bottom. Tanks of this kind can be obtained in capacities of from 13,000 to 90,000 gal., costing, with heating coils and pipe, asphalt pump, and 25 hp. boiler, from $1,100 to $3,000, exclusive of the labor of setting up.

Other styles of tanks include underground concrete structures with walls from 3 to 4 in. thick and floors 5 in. thick. Great care must be exercised to make these tanks water-proof, as the entrance of water causes endless trouble.

In some localities, especially where refineries are situated near the larger cities, heated asphalt can be delivered to contractors or municipal plants by means of barges. The City of New York obtains a aprt of the asphalt for its municipal plants in this way, the barges making deliveries from the New Jersey shore to plants in Brooklyn and Manhattan.

New York City Traffic Court Jails 23 Speeders in One Day

On Oct. 12 the business record of the Traffic Court of New York City was broken, when Magistrate Frederick B. House heard 225 cases. Five of the offenders were given unconditional jail sentences, 18 were sent to prison in default of fines and 130 paid fines ranging from $25 to $100. A total of $4,800 was collected.

Missouri Increases Unit Prices on Road Contracts To Cover Freight Rates.

State Last Year Adopted Policy Putting Freight Increase Clauses in Contracts

Contractors holding contracts for state and federal aid work in Missouri will be granted an increase in unit prices to compensate them for the increased freight rates, according to a statement by Charles U. Baker, Chief Clerk of the State Highway Department.

Last year the State Highway Department failed to secure active bidding upon highway work and, upon investigation, found that many contractors were holding back because of the uncertainty of freight rates. Then the department began writing a freight compensatory clause in contracts.

On contracts using local materials for the most part, the new freight rates will not greatly increase road building costs. "But on a rail haul of 100 mi.," said Mr. Baker, "the 35% increase will mean an increased cost of approximately $1,100 per mile on an 18-ft. concrete road. For the same haul an 18-foot gravel road would cost approximately $980 more than it would have cost prior to Aug. 26."

Falling Rocks Make Columbia River Highway Tunnels Unsafe

The twin tunnels between Hood River and Mosier, Ore, on the Columbia River Highway, have been rendered unsafe because of falling rocks, according to Herbert Nunn, State Highway Engineer. Signs have been placed at the tunnels warning motorists that they pass through the tunnels at their own risk. In some places the tunnels have been shored up with timbers.

The State Highway Department has called for bids for concreting the tunnels and it is expected that the work will be done immediately.

Concrete Pavement Foundations in California To Be Five Inches Thick and Reinforced

The California State Highway Commission has ruled that no concrete base less than 5 in. thick shall be laid on any state highway and that all concrete bases are to be reinforced with steel.

"On all future day labor authorizations and contracts for the construction of concrete bases and shoulders," says A. B. Fletcher, State Highway Engineer, "the outer edges shall be reinforced by ½-in. square deformed steel bars placed longitudinally along the edges, centered in the depth of the slab and placed 2 in. from the outer edge. Such longitudinal bars shall be lapped 12 in. for bond. At intervals not greater than 30 ft., the bars shall be butted and not lapped. Transverse reinforcement shall consist of ⅜-in. square deformed bars placed transversely on 18-in. centers, such transverse bars being hooked over the longitudinal bars and securely wired thereto."

Highway Work in Missouri

State Has 6,000-Mile Program and Has Let Contracts Aggregating $20,000,000

The Missouri State Highway Department, at its last meeting in September, approved applications for state and federal aid for 67.21 mi. of highways. The total estimated cost of this mileage is $628,096.16 of which $314,034.58 will come from federal funds and the remainder from the state and counties.

This action of the department brings the total mileage approved to receive state and federal aid up to 1,931.57 mi., the construction of which is estimated to cost $20,202,102.06. Of this amount, $10,108,484.20 is from federal and $1,312,519.25 is from state funds.

Last year the Missouri road law was amended so as to provide for a 6,000-mi. system of state highways. This mileage will be distributed among the 114 counties according to area and mileage of roads. So far surveys have been completed for about 4,000 mi. of roads.

The applications aproved so far by the department are divided into 191 projects in 71 counties.

Alaska Road Commission Reorganized

The Alaska Road Commission has recently been reorganized and has now the following personnel: Maj. James G. Steese, Corps of Engineers, President; Capt. J. C. Gotwals, Corps of Engineers, and Capt. C. S. Ward, Corps of Engineers, Secretary. The headquarters are at Juneau, with offices located at Valdez, Seward, Fairbanks and Nome.

The road system of Alaska comprises about 5,000 mi. of wagon and sled roads and trails, of which about 1,000 mi. are classified as wagon roads.

Grand Jury Investigates Strike Fund of San Francisco Contractors

Six members of the Team and Auto Truck Association of San Francisco, Cal., were recently indicted by the grand jury for alleged unlawful combination in bidding on grading work. One contractor who refused to join the combination is reported to have stated that 12% was added to all bids, which was to revert to a secret fund. The accused contractors admit the existence of this secret fund and assert that it was instituted as a strike fund to be used in event of labor troubles. The San Francisco press has devoted considerable space to the so-called scandal.

Motor Vehicles in United States Kill One Person Every 31 Minutes

Highway Fatalities in 1920 Estimated to Amount to 110 per 1,000,000 Population

Automobile fatalities in the United States have grown to 100 per 1,000,000 population in 1919, according to C. M. Talbert, Chairman of the Public Safety Section of the National Safety Council, who estimates these fatalities will increase to 110 in 1,000,000 population in 1920.. This will mean one death every 31 minutes of the 16 waking hours of each day. That this great increase in fatalities does not correspond with the increase in motor vehicles is seen in the fact that the number of fatalities has dropped from 2,756 in 1912 to 1,282 in 1919 for each 1,000,000 automobiles.

The total of vehicular accidents increased from 245 per 1,000,000 in 1906 to 253.3 in 1919, while all other forms of accidents decreased 18%. It is further pointed out by Mr. Talbert that 90% of all accidents in the country occur on public highways.

HIGHWAY TRANSPORTATION

Farmers in Corn Belt Use Motor Trucks To Market Products

Owners Report Trucks Save Two-thirds of Hauling Time While Use is Hampered by the Poor Condition of Earth Roads

Summarizing the experience of 831 Corn Belt farmers, the U. S. Department of Agriculture found that in the opinion of nine-tenths of these men, the greatest advantage in owning motor trucks is "saving time," and that in the opinion of three-quarters of them, the greatest difficulty in securing the greatest benefits from motor trucks is "poor roads."

The trucks owned by these farmers travel on an average 2,777 mi. a year. The cost of operation is between 16.5 and 17 ct. per mile, making the total annual cost between $460 and $470. The average saving in horses amounts to $240 and the average saving in hired help is about $163.

The investigation was made during the past winter and spring. Farmers in Indiana, Illinois, Missouri, Iowa, southern Wisconsin, southern Minnesota, southern South Dakota, eastern Nebraska and eastern Kansas, who raise corn as one of their principal crops, reported to the department the use they make of their trucks.

The average size of the farm is 346 acres, and the average distance of the farms from market is 8 mi. By the use of trucks a little over one-fourth of these men have been able to change their markets. For those farmers who changed market, the average distance to the old market was 7 mi., while the new market is 18 mi. away.

Experience with trucks has caused 57% of these men to decide that the 1-ton size is the best for their conditions, 25% that the 1½-ton truck is the best, and 12% that the 2-ton size is best. As compared with horses and wagons, the trucks save about two-thirds of the time required for hauling to and from these farms.

The roads over which nearly 95% of the trucks travel over are all or part dirt. About eight weeks in the year the roads are in a condition which will not permit the use of trucks. Better roads, it is reported, will do much to increase the use of motor trucks.

About 25% of the trucks are equipped with pneumatic tires, 27% with solid tires, and 48% with pneumatics in front and solids in the rear.

The average cost of operation, including depreciation, interest on the investment, repairs, fuel, tires, etc., is about 15.2 ct. per mile for the ½, ¾ and 1-ton trucks, 21.3 ct. for the 1¼ and 1½-ton trucks, and 25.8 ct. for the 2-ton truck. The average cost of hauling crops, including the driver's time at 50 ct. per hour, is 24 ct. per ton-mile with the ½ and ¾-ton trucks, 24.1 ct. with the 1-ton, 23.3 ct. with the 1¼ and 1½-ton trucks, and 21.5 ct. with the 2-ton trucks.

Nearly 85% of the trucks covered in the report had not been out of commission during the year covered by the reports, and 80% of the owners stated that they had not lost any appreciable time on account of motor and tire trouble, breakage, etc., when using their trucks.

Traffic Rules in Japan.

In Japan there is an organization which seeks, like the well-known Automobile Association and Motor Union of Great Britain, to give timely advice to motorists in that country. How intensely imitative they are may be seen from the following rules: "At the rise of the hand of policeman stop rapidly. Do not pass him by or otherwise disrespect him. When a passenger of the foot hove in sight, tootle the horn trumpet to him melodiously at first. If he still obstacles your passage tootle him with vigor and express by word of mouth the warning, 'Hi, Hi.' Beware of the wandering horse, that he shall not take fright as you pass him. Do not explode the exhaust box at him. Go soothingly by. Give big space to the festive dog that makes sport in the roadway. Avoid entanglement of dog with your wheel spokes. Go soothingly on the grease mud, as there lurks the skid demon. Press the brake of the foot as you round the corners and save the collapse and tip-up."—"Municipal Engineering," London.

An airbrake which can be used on any motor vehicle, semi-trailer, or trailer, has been placed on the market by the Lane Air Brake Co., of San Francisco, Cal. No changes are required in the regular truck equipment, it is stated, and the air brake possesses many advantages over foot and hand brakes. In a train of trailers, the brakes of all the vehicles operate together, thus giving perfect control of the entire train at all times.

The Federal Electric Railway Commission, appointed by President Wilson, May 31, 1919, to conduct an investigation of the street railway situation, has completed its report. It is recommended by the commission that operators of motor buses be compelled to pay taxes proportionate to the burdens they place upon the highways as compared with the burdens placed upon the highways by the street cars. Under present conditions motor bus operators enjoy, the report says, "the untrammelled freedom from taxation, maintenance of highways and financial responsibility for accidents."

MEETINGS

Calendar of Coming Meetings

Nov. 8-12.—League of California Municipalities.—Annual convention, Chico, Cal. Executive secretary. W. J. Locke, Pacific Bldg., San Francisco, Cal.

Nov. 15-17.—City Managers' Association.—Annual convention, Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York, N. Y.

City Managers' Association

Among the topics which will be discussed at the annual convention of the City Managers' Association, to be held Nov. 15-17, in Cincinnati, O., will be, "A Model Paving Program for a City of Twenty Thousand." Representatives of various paving material interests have been invited to present 15 minute papers, after which a general discussion will take place.

Another subject of interest to road builders which will be taken up, is, "The Relation of Motor Trucks to City Business."

American Association of State Highway Officials

The Executive Committee of the American Association of State Highway Officials met in Washington, D. C., on Sept. 21, and decided to hold a four-day convention in Washington, D. C., starting Dec. 3.

The Executive Committee of the association visited the experimental station of the U. S. Bureau of Public Roads at Arlington and also conferred with representatives of the motor truck industry and officials of the U. S. Bureau of Public Roads.

Pennsylvania Association of County Commissioners

The annual convention of the Pennsylvania Association of County Commissioners was held at Wilkes-Barre, Pa., on Sept. 28 and 29. Among the speakers was State Highway Commissioner Lewis S. Sadler, who stated that large sums of money are wasted each year by the townships because there is no uniform method of planning road work throughout the various counties. Commissioner Sadler also gave a resume of the work being done by the State Highway Department.

The following officers were unanimously elected: President, P. A. Meixell, Philadelphia; First Vice President, Joseph H. Nicely, Lycoming County; Second Vice President, James A. Hamilton, Delaware County; Secretary, L. C. Norris, Clearfield County; Treasurer, Addison White, Warren County.

PERSONAL MENTION

John A. Bruce has resigned as city engineer of Omaha, Neb.

H. A. Stevens has resigned as engineer of Nueces County, Texas.

O. N. Powell has been appointed engineer of Nueces County, Texas.

Lloyd Aldrick, County Engineer of Sonoma County, California, has resigned.

Ralph Arnold has been appointed highway engineer of Contra Costa County, California.

M. O. Bennett has resigned as division engineer of the Oregon State Highway Department.

F. H. Newell, head of the Department of Civil Engineering at the University of Illinois, has resigned.

Ira O. Baker, Professor of Civil Engineering in the University of Illinois, is now acting head of the civil engineering department.

R. H. Baldock has been appointed division engineer of the Oregon State Highway Department, with headquarters at Pendleton.

W. J. Powell has resigned as county engineer of Dallas County and is now engaged on water supply work for the City of Dallas, Texas.

Joshua Breed, formerly City Engineer of Louisville, Ky., has been appointed chief engineer of the sewer commission of that city.

R. A. Meeker, at one time State Highway Engineer of New Jersey, has been appointed executive head of the Right of Way Bureau of the New Jersey State Highway Department.

Sidney W. Cooper, formerly with the New Jersey State Highway Department, is now assistant division engineer with the Alabama State Highway Department, with headquarters at Selma.

OBITUARY

S. D. Porter, City Engineer of Peru, Ill., for over 20 years, died recently at La Salle, Ind.

Walter C. Paton, formerly City Engineer of Kansas City, Mo., died there recently at the age of 38.

Hugh B. Raines, formerly City Engineer of Dallas, Texas, for a period of 20 years, died recently at Louisville, Ky., at the age of 70.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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AMERICAN HIGHWAY ENGINEERS' HANDBOOK
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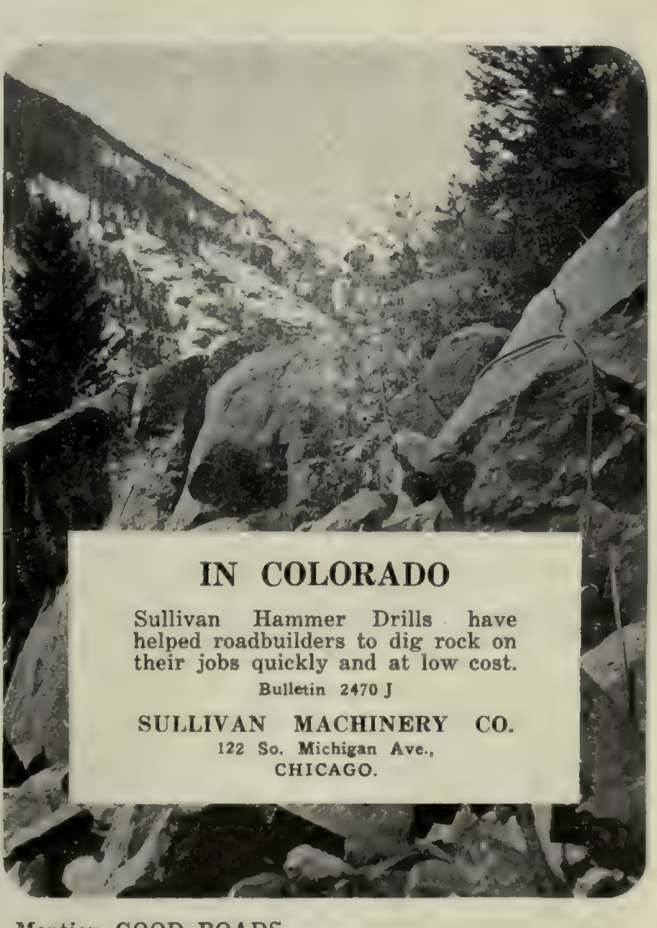

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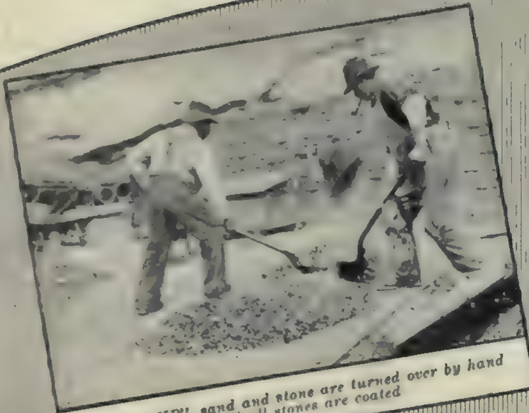

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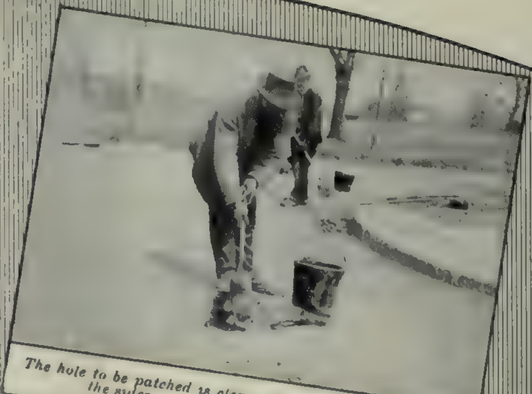

The hole to be patched is cleaned out and the bottom and the sides are painted with "Tarvia-KP"

The mixture is shoveled into the hole and is well tamped

Workingman in foreground is scattering screenings over seal-coat. Then patch is again tamped

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GOOD ROADS
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JAMESTOWN, N. Y., OCTOBER 27, 1920
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Japan Inaugurates Road Building Era

Highways in Early Times—Former Construction Methods — Present Road Laws and Funds—City Paving Programs — Labor Conditions

Prior to the year 1865, when Commodore Perry visited Japan, roads in that country were given scant attention, as were other factors of national progress and development. But with the awakening of this great country and the adoption of western civilization, the relation between good roads and domestic and foreign commercial expansion became evident. Accordingly, Japan is preparing to become one of the great nations of the world by developing her highways, and enters upon a program involving vast expenditures and new methods. Books on highway construction and maintenance by American authors have been translated and are being circulated widely.

Road work has been carried on in Japan for many centuries. Tradition has it that the Sanyo-Do Road in southwestern Japan was constructed about 600 B. C. At the opening of the 8th century roads had been built conecting nearly all parts of the country. However, these highways were used mainly by persons connected with the government and were not used by the general public until the 10th century. During the feudal period many military highways of a local nature were constructed, until 1577, when political unity of the country was brought about. In the first part of the 17th century several national highways were built, 30 ft. wide, and marked at intervals on one ri (2.44 mi.) with hills on each side, on which were planted evergreen trees. The hills on which these trees were planted were about 30 ft. square and the trees were trimmed round. Thus, in a way, Japan was the first country to appreciate the value of beautifying its highways.

Throughout the centuries little change was made in Japanese highways until the last half of the last century, at which time broken stone, sand and gravel found favor in road construction. Cartloads of pebbles or broken stone are now dumped and spread

ROAD THROUGH VILLAGE OF CHUZENE JAPAN—WIDTH VARIES FROM 5 TO 10 FEET

THE BUND, YOKOHAMA—WATER-BOUND MACADAM ALWAYS IN BAD CONDITION upon the road, leaving the rolling to be done by the traffic. Naturally the roads are full of mud-holes and ruts.

Practically all Japanese roads are constructed with a top dressing of sand and gravel laid upon the natural soil. A few short stretches of city streets are paved, but even these are usually in poor condition.

Since 1881 the national government has appropriated funds for road work, but the money from this source has been small, amounting to about 60,000 yen ($29,910, normal exchange) per year. However, the Highway Council, an advisory body to the Home Minister, has passed a resolution that national funds shall be granted for one-half of the cost of road construction. It is planned to appropriate 9,400,000 yen annually for road work, and a bill appropriating 2,500,000 yen for work to be done in 1920 was recently passed by the Diet.

In April, 1919, a new highway law was passed, and the highways of the country were classified in five divisions; national, prefectural, county, municipal and town roads. The total mileage of these roads is 304,227 mi., with 5,305 mi. of national highways, 23,265 mi. of prefectural and 275,657 mi. of county and other highways. There are 346,144 bridges over 6 ft. in length on these roads.

Authority is given the Home Minister by the new highway law to issue regulations on the specifications of road and bridge construction. He has ruled that national highways must be not less than 7.5 meters in width and important local roads not less than 5.5 meters in width. Avenues must be not less than 40 meters wide, first class streets not less than 20 meters and second class streets not less than 11 meters.

Plans have been formulated for the construction of a system of national and local highways and a program covering 30 years has been mapped out. The roads between Tokyo and Yokohama, and between Osaka and Kobe have already been started. Besides this work on national roads, many cities have large paving programs. The City of Tokyo will spend 60,000,000 yen for paving in 7 years, Oska will spend 104,000,000 yen in 10 years, Yokohama 20,000,000 yen in 3 years, Kobe, 18,000,000 yen in 4 years, and Nagoya, 18,000,000 yen in 3 years. In these cities the paving will be bituminous macadam, wood block, brick and stone. One-third of the cost of these improvements is borne by the national government. Other cities are engaged in the preparation of comprehensive street paving programs.

As yet Japan has no road tax and has not adopted the policy of issuing bonds for road improvements, the road funds coming out of the general taxes.

Labor which formerly was so cheap and plentiful in Japan, is becoming scarce and high priced, and it is probable that labor saving machinery will in a short time find wide application in that country. Convicts have not yet been used in road work.

Some time ago a prominent American advocating good roads in Japan suggested that foreign road builders be employed to help carry out the development of Japanese highways, but vigorous protest was raised against such action by Japanese engineers.

Highway Plans in Virginia

If the $40,000,000 road bond issue is authorized by the vote of the people of Virginia at the November election, Virginia will start upon a six-year road building program calling for the completion of the state highway system of 3,800 mi. It is planned to issue bonds in annual installments of from $3,000,000 to $10,000,000.

Combined with the estimated revenues available from other sources, the total amount available for road building in the state during the period from 1922 to 1927, after deducting interest on bonds, will be $68,450,000, or an average of $11,400,000 per year, according to estimates of the State Highway Commission.

Kentucky Convicts Will Work on Roads Throughout the Year

The Kentucky State Board of Charities and Corrections has notified Joe S. Boggs, State Highway Engineer, that the requisition for convicts to work on state highways will be honored. It had been expected that the board would refuse to take this action.

It is the purpose of the Department of Public Roads to employ convicts on the roads the entire year. This winter 75 men will be kept in Harlan County, 40 in Pike County, and 25 each in Rockcastle, Cumberland and Metcalfe Counties. Hitherto, convicts have been employed on the roads only seven months in the year.

Highway Work in North Carolina

During the month of August the North Carolina State Highway Department awarded contracts for highway and bridge construction amounting to over $1,000,000. Contracts embracing 10 projects for 91.88 mi. of highway were let at an estimated cost of $880,207.52, and 2 contracts for bridge construction were let at an estimated cost of $221,650.17.

One of the bridge contracts is on the largest single project yet undertaken by the department. A reinforced concrete bridge consisting of 3 open spandrel ribbed arches, each of 147 ft. span, and 14 concrete deck girder approach spans of 40 ft. each, will be built over the Yadkin River at the Swift Ferry, at an approximate cost of $192,500. About 55 cars of cement, 105 cars of gravel, 55 cars of sand and 10 cars of steel will be required for the construction of the bridge, which will require 520 working days for completion, according to present estimates.

Paving Brick and Brick Pavements*

By J. C. TRAVILLA†

The widespread use of brick pavements, the indefinite policy in the paving brick industry as to sizes and types, public sentiment, and the engineer's preference for particular "standard" designs and construction methods based on local results, make the standardization of paving brick and of brick pavement designs and specifications by no means a simple matter.

The paving brick industry has had much to contend with recently, through war restrictions, low production, increased costs of labor and fuel, lack of transportation facilities and the like. This has been reflected in the so-called high cost of brick pavements when competing with other types on the basis of first cost alone, instead of annual costs during the pavement's life. Because of this, brick pavements have sometimes been considered too costly, with the result that business has been restricted. This has caused some unrest among certain manufacturers and may be considered one of the reasons for the request for certain amendments to brick specifications, made by the National Paving Brick Manufacturers' Association at the 1919 meeting of the American Society for Municipal Improvements.

Possibly because of a lack of cooperation or coordination in the paving brick industry by limiting the production to a few types, manufacturers are reported to have twelve different styles of brick for paving. No arguments are needed to prove that this situation should be corrected, but who is to be held responsible? Certainly not the engineers. Engineering organizations have been working for years through special committees to standardize pavement specifications. Their recommendations for brick include two types and they have been adopted generally by municipal and state highway engineers.

Paving brick manufacturers should realize that they are merchandizing their output through engineers representing the taxpayers, and that any request to change sizes and types of brick or amend specifications to meet changed conditions affecting the industry should be based on definite technical information proved by experience.

The necessity for modifying designs and specifications to meet local conditions is recognized, but the advisability of attempting to adopt these modifications as "standards" is questioned. It is also appreciated that brick has its limitations and its place in the paving of streets and roads.

A study of existing brick pavements and the effects upon them of traffic and of soil and climatic conditions shows a process of elimination in types of brick and brick pavement design. The evolution has been gradual, because it has required time to demonstrate the relative merits of different types and designs.

When paving brick was introduced in 1870, the "standard" was a plain wire-cut brick, and the design provided for a sand cushion, a sand filler, and a foundation of No. 2 brick laid flat, rolled stone, or gravel. Pavements of this type have been in service for thirty years. They have proved the wearing qualities of No. 1 brick and have been a good investment for taxpayers, but they have somewhat handicapped the industry, because the change in motive power of vehicles has created a demand for pavements to carry an increased weight and volume of traffic and for smoother pavements, and because the average taxpayer does not realize that these pavements have given full service and have been used through more than the normal life of a brick pavement. Many of these pavements are rough and unsanitary, because the unprotected edges of the brick have been cobbled and they are uneven because of frequent openings in the surface and the movement of the sand cushion under the vibration of heavy traffic. Thirty years is more than the life of any pavement under normal traffic—unless it be granite block—but many brick pavements have been in use for that length of time.

In an attempt to overcome the disadvantages of sand filler, engineers began to use tar, pitch mastic or cement grout filler, which resulted in the introduction and adoption of repressed brick without buttons, bars or raised letters on the side to admit the filler to the full depth of the brick. The merits of this style of brick were recognized and it was was adopted as a "standard."

Tar did not prove an entirely satisfactory filler, because of the difficulty of maintaining it in the joints and flush with the top, and the pitch mastic was introduced to overcome this objection. The cement sand filler, because of its structural advantages and the apparent ease of mixing and applying it, together with its low cost, brought about its very general use. Imperfect workmanship in securing the proper consistency, in methods of application, in the preparation of the bedding course and in securing maximum penetration, led to defects in grout filled brick pavements. In addition, temperature stresses not uniformly distributed because of poor grouting, caused failures, with the result that asphalt was advocated to eliminate the hazard in the use of grout fillers.

The rounded edges of repressed brick made it difficult to keep the grout filler flush with the top of the brick, and repressing sometimes caused laminations that affected the internal structure and durability of the brick. In addition, in repressing, the buttons or projections were frequently deformed so that they did not serve their purpose. These factors led to the perfecting of the wire-cut brick which was introduced in 1910 and has been adopted as one of the "standard" types by many city engineers and organizations. The use of this type will assist in eliminating some of the construction hazards, but no type of brick or other material used for surfacing is entirely free from structural defects, due to the "human equation," nor will entirely resist the natural forces which tend to destroy pavements.

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*Abstract of a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Consulting Engineer, Dunn Wire-Cut Lug Brick Co.

Under existing conditions in the paving brick industry, the engineer is not in a position to recognize one "standard" style of brick, nor should he consider but one design for brick pavements. It is possible, however, to adopt types of brick that have proved their merit in service, and to design pavements with reference to local conditions and requirements.

A lugless paving brick has been advocated on the theory of commercial and economic advantage to the paving brick industry, without due regard to past experience or the best engineering practice in brick pavement construction. This type, we are advised, will provide for spacing by means of kiln marks on the brick or roller action in preparing the surface. The word "uniformity" is probably the most important slogan in the construction of pavements, regardless of the kind of material used, and it is believed that to adopt as "standard" a type of brick that does not insure definite and positive joints is a backward step in brick making and pavement design. The reasons for this belief are:

(a) Experience and experiments have demonstrated the necessity of definite joint spacing to permit the filler to penetrate to the full depth of the brick.

(b) If a bulge on the end of a lugless brick is desirable to provide for spacing, it should be self evident that definite joints should be required on the side of the brick.

(c) Manufacturers have advocated the use of bricks with lugs, buttons or bars to provide positive joints. Abandoning this policy at a time when engineers are not in a position to experiment seems to be a serious mistake, but, fortunately, only a limited number of plants are making lugless bricks.

Engineers and engineering organizations are interested only for the purpose of obtaining specifications that will produce dependable brick pavements, but unless their attention is specifically directed to certain features of paving brick, they are not likely to be discussed, nor is it likely that they will adopt as "standard" specifications that will benefit all parties interested.

At the Grand Rapids meeting of the American Society for Municipal Improvements in 1911, there were adopted specifications for a standard size paving block 3½ in. wide, 4 in. deep and 8½ in. long, with lugs not over ¼ in. high on one side. The same specifications were adopted by the Association for Standardizing Paving Specifications in 1912. Engineers generally, call for this size in their specification, and any material change in the "standard" size would cause inconvenience in repair and maintenance and undo a great deal of work that has required years for its accomplishment.

Western paving brick manufacturers have established a market for a brick 3 in. deep, with bars on the side to provide spacing, known as vertical fiber brick. The 3-in. size has never been standardized by the industry or a national organization, and there is no question as to the desirability of adopting definite standard sizes and tests for both vertical fiber and wire-cut brick. Repressed bricks are not manufactured in the 3-in. size.

Refined asphalt has been used extensively and with various results as a filler for vertical fiber brick pavements. The quality of the material, its melting point, and the skill used in heating and applying, are important factors in its success or failure. The practice of applying enough asphalt to construct a bituminous mat over a brick pavement does not appear to be good practice. The asphalt will not adhere at all seasons and will peel off unless held in place by a mechanical bond due to the rough texture of the brick or to the joint spaces. Applying asphalt by the squeegee method often bridges over joints. Pouring into the joints insures better penetration and the saving in the amount used will more than pay the cost of the additional labor.

The filler provides for expansion stresses and helps make a smooth surface, providing the joints are filled flush with the surface. On pavements carrying a large amount of horse and steel-tired traffic, the filler will be cut out of the joints at the top within a few years and will require renewal. This maintenance feature is generally overlooked.

The engineer is frequently in doubt whether to use a bituminous or cement grout filler. Each type has its place and the engineer should carefully analyze local conditions. As a general proposition, bituminous filler is best adapted to a wearing surface laid upon a new macadam or gravel foundation, while the cement grout filler is adapted to use where the subgrade is stable and where there is a rigid foundation.

Failures of foundations under all types of surfacing have raised the question of whether the failures were due to motor truck loads and wheel impact, or to poor design or construction, or to inadequate drainage and low bearing value of the subgrade. Engineering organizations are making special studies of the bearing power of soils that should prove of great value in foundation design. For a

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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A LAYOUT OF A NATION-WIDE HIGHWAY SYSTEM NEEDED

The United States and the several individual states long ago definitely committed themselves to an extensive program of highway improvement. The work has been going forward for a number of years and the major portion of it has been done in an economical and effective manner. It is going to continue, we believe, for there is now a stronger and more widespread demand for good roads than there ever was before.

Since the beginning of the good roads movement, however, traffic has undergone a remarkable change in character and it has grown to proportions hardly imagined possible twenty years ago. Where there were once hundreds of horse-drawn vehicles, there are now thousands of automobiles and motor trucks. Construction methods have been modified to meet these changing conditions. More durable surfacings have been designed and built; roads have been relocated to meet the requirements of new kinds of traffic; maintenance has been given more attention. From a hap-hazard sort of work performed by men with no special fitness, highway work has grown to a highly specialized branch of engineering employing men of exceptional technical training and mature experience. By no means all of the problems that have come up have been solved, but in the main, practice has kept step with traffic.

In one particular, however, the development of the science and art of road building has lagged behind the demands upon it. Road systems are not laid out in a manner adequate to the needs of the times. The chief reason for this is probably lack of the cooperation required under present traffic conditions.

In the days before automobiles and trucks were used so extensively as they are now, traffic was local. Pleasure drives ordinarily did not exceed a few miles, reckoned by modern standards, and teaming was generally a short-haul undertaking. Roads extending out from market towns and other centers into the surrounding country formed practically complete highway systems in themselves. These small local systems were often connected by turnpikes of considerable length that sufficed for the comparatively small amount of long-distance road travel and hauling.

Present traffic conditions require very different systems. The passenger car and motor truck have practically unlimited ranges. Both business and pleasure take the automobilist hundreds of miles, across county and state lines and often through several states. The growth of highway transportation has made trips of several hundred miles matters of everyday occurrence and has eliminated state lines, insofar as routes are concerned. Highway traffic has become as truly interstate traffic as is railway traffic.

These conditions call for a nation-wide highway system, for the abandonment of the old viewpoint in planning and the adoption of a new one of national scope. Local traffic still exists—indeed, its volume is far greater than ever—and it must be provided for. But in addition, provisions must be made for traffic between adjacent states and between widely separated states—even to the extent of transcontinental routes and, in some instances, thoroughfares connecting at the national boundary with the systems of neighboring countries.

The planning of a system adequate to these needs is a matter for close cooperation among local road authorities, the state highway departments and the federal road officials. Naturally, the needs of any given locality are best understood by the local authorities. The officials of a town, for instance, should understand the road needs of that town better than the county highway officials do. In like manner county officials can be expected to have a better understanding of the county's needs than the state highway department has and the latter is doubtless better informed than any federal official as to the requirements of the state. On the other hand, the knowledge of the county officials should be drawn upon for the purpose of adjusting the systems of various towns to the county system; the state highway department should be called to the assistance of the counties in welding county systems into a state system, and the officials of a federal body should lend their aid to so coordinating the state systems as to provide for an interstate or nation-wide system.

Intelligent effort by all these agencies and thorough cooperation among them would provide local systems and a national system that would meet the requirements of present and future traffic. It would also effect a saving by eliminating useless duplication of effort and by concentrating expenditures where they would be most effective.

Paving Brick and Brick Pavements

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national engineering organization, however, to consider a reduction in the thickness of concrete foundation to less than 6 in. under existing conditions will not meet with the aproval of engineers. On the other hand, engineers should be sufficiently informed to modify "standard" foundation designs to meet local conditions. It is also reasonable to suggest variations in the depth of concrete foundation depending upon whether cement grout or bituminous filler is used, but this should be treated as a local matter.

The bed or so-called cushion for brick pavement may be of sand, cement-sand, slag or stone screenings, and is usually 1 in. deep. Sand has been used with more or less success, depending upon the care taken in preparing the bed and the quality and grading of the sand. Fine sand with a small amount of loam or silt has not given entirely satisfactory results, because of its tendency, when moist, to work into the joints and prevent the filler from penetrating to the full depth and its tendency, when dry, to subside leaving partly filled joints. Defects in brick pavements due to temperature stresses may be attributed to the sand bed or to poor grouting. A bed of coarse sand drains much better than one of fine sand, and, when properly rolled and struck off, furnishes a satisfactory bed of uniform density.

Many engineers recommend a cement-sand bed, generally consisting of 1 part of cement to 4 parts of sand, spread dry over the artificial foundation. The mixture may work into the joints, but will remain there. Furthermore, it prevents shifting of the bed under the vibration of vehicle traffic, and so furnishes a uniform bearing for the brick. "Standard" specifications for cement-sand bed would appear to be worthy of favorable consideration and adoption.

Engineers differ as to the use of expansion joints at fixed intervals in a brick pavement with a cement grout filler. The advisability of attempting to control temperature stresses with transverse joints is questioned. A study of pavements with expansion joints indicates weakness in the structure at or near the joints. No. 1 paving brick will not crush under expansion stresses, if the grout extends to the full depth of the brick. Expansion stresses may be divided into a number of units by paved street intersections which confine them within the limits of one city block. Where they are not so confined, they are cumulative over the entire length of the pavement and there is likely to be a rupture at the point of the least resistance, ordinarily a sudden change in the grade or where there is some structural defect. A large percentage of blow-ups in grouted brick pavements are due to defective joints at the end of a day's run or at a break in the grade..

This theory as to the elimination of expansion joints justifies the opinion that each paved street intersection may be considered a "compression header." If an intersection is not improved, a concrete header should be placed at the beginning and end of the work to confine the stresses within the limits of one block. A complete separation of the pavement proper is necessary at alley entrances and driveways. It would be desirable also to construct manhole frames and castings so that they could move with the paving. Longitudinal expansion joints should be placed at each curb line to permit free movement of the slab and take care of the transverse expansion.

In directing attention to certain features of paving brick and brick pavements, it seems consistent to add that no one material or design will meet every local requirement, nor will pavements be free from inherent defects due to materials or to methods of manufacturing. The engineer's problem is to adopt materials, designs and specifications that will meet local requirements, and in this process, experience is the best teacher.

Road Work in Clark County, Oregon

More than $1,350,000 has been spent in paving roads in Clarke County, Oregon, during the past two years, in addition to the money spent by the City of Vancouver.

The contract of the Puget Sound Engineering Co., is being completed by the bonding company and when the work is completed a paved highway will extend from the Columbia River interstate bridge to within half a mile of Pioneer, a distance of 14.5 mi. The half mile will be completed next year, making a paved road from Vancouver to Ridgefield. The North Bank Highway from Vancouver to Camas, with the exception of 1½ mi., will be completed this year. The pavement between Hazeldell and Felida, a distance of 4½ mi., has been laid and the road opened to traffic.

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Columbus, O., Will Spend $1,000,000 in 1921 for street paving, according to recent estimates. Six streets are to be paved at a cost of $800,000.

Bridge Across Ohio River Proposed

Residents of southwestern Indiana and western Kentucky are advocating the construction of a new highway bridge between Evansville, Ind., and Henderson, Ky. At present there is a railroad bridge between Henderson and Evansville. The Evansville Chamber of Commerce has become interested in the matter and will direct the attention of highway officials of both states to the importance of the proposed bridge.

Road Construction in Pennsylvania

The Pennsylvania State Highway Department has announced that during the week ending Oct. 14, all records of road construction in that state were broken. During that week 26.27 mi. of pavement were laid on various construction projects.

During the present construction season the State Highway Department has contracted for approximately 230 mi. of paved highways. The maintenance forces of the department have resurfaced approximately 315 mi. of macadam roadway and have oiled 1,300 mi. of highways.

Detroit Will Build Belle Isle Bridge

The City Council of Detroit, Mich., has approved the plans for the proposed Belle Isle Bridge and bids will be asked for shortly. The bridge will be 2,200 ft. long with 20 spans 74 ft. to 135 ft. in length, and will have a width of 88 ft. with a 59-ft. roadway paved with asphalt and accommodating six lines of traffic. A 12-ft. sidewalk will flank either side of the structure. No drawspan is provided, the clearance being 30 ft.

It is thought that if work is commenced on the structure this fall, the piers ought to be completed and ready for the steel work by 1922. The commission which drew up the general plans is composed of M. E. Cooley of the University of Michigan, Chairman; Emil Lorch, H. S. Riggs, William Kales, Francis McGrath, with Prof. L. M. Gram as engineer for the commission. The estimated cost of the structure is $2,000,000.

Contractor Makes Record Laying Concrete

Lays 588 Linear Feet of 16-ft. Concrete Road in 10 Hours with 1¼-Minute Mixes

George Walters & Sons, contractors on Highway No. 78, Butler County, Pennsylvania, on Aug. 25 laid 525 ft. of 16-ft. concrete roadway in 10 hours, which is said to be a record for that state. On Sept. 2 the same contractor laid 551 ft. of pavement and on Sept. 16 laid 588 ft. in 10 hours. The previous record for the state is given as 480 ft. in 10 hours.

Since the mixing time required in Pennsylvania is 1¼ minutes, it was necessary to get out a batch every 1¾ minutes to accomplish the 588-ft. record. This left 30 seconds for charging and discharging the mixer. Skillful operation of the mixer and efficient organization and equipment made this record possible, according to W. A. Palmer, Superintendent on the job.

Materials were brought on the job by trucks and loaded into the skip by wheelbarrows. A 14-E Rex paver was used, equipped with a 20-ft. distributing boom and bucket and an automatically operated discharging chute. The mixer was also equipped with a timing device.

New Jersey to Experiment With Gravel Roads

Three experiments on the use of gravel in road construction will be conducted by the New Jersey State Highway Department. The first test will be made by paving ½ mi. of road in South Amboy with gravel with a lignin binder.

Two other sections of road will be built on route No. 4. One will consist of an especially prepared gravel base with a 2-in. bituminous top; the other will have a gravel and cement base with a bituminous top.

Florida To Vote on Road Bond Amendment

The people of Florida will vote on an amendment to the state constitution authorizing the state to issue bonds for the construction and maintenance of roads and bridges. At the present time Florida may not issue bonds for public improvements. If the proposed amendment is ratified at the November election, the Legislature next spring will authorize bonds for road work.

Oregon Sells Highway Bonds

The Oregon State Highway Department has sold $2,000,000 of road bonds to a syndicate of bankers for $1,822,202. The bonds bear 4½% interest and mature serially after 1925. This sale shows a slight improvement over the sale of $1,500,000 of road bonds in August, sold on a 90.8 basis. These bonds are issued under the $10,000,000 road bonding act passed by the 1919 session of the Legislature. The total road bond indebtedness of the state is brought up to $18,243,750 by the recent sale of bonds.

Section of Bankhead Highway in Arkansas Under Improvement

Bonds totaling $565,000 have been sold for the construction of 65 mi. of highway between Hot Springs, Ark., and the Pike County line, connecting there with the DeQueen Highway. The bonds were sold at par and the contract awarded to Llewellyn & Cobb, of Little Rock. The road must be completed in twelve months.

It is expected that an additional $80,000 of federal aid funds will be allotted for work on this highway, which is a part of the Bankhead Highway.

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

Representatives of many cities and towns and chambers of commerce throughout Massachusetts gathered at the State House on Oct. 20 to discuss with Commissioner John N. Cole, head of the Department of Public Works, plans for keeping the main highways open throughout the snowstorms expected this coming winter.

Commissioner Cole announced that under the provisions of a law enacted by the last Legislature, $50,000 is available for the department to be used in cooperating with communities throughout the state, manufacturing interests and truckmen, in equipping trucks with snowplows and using them everywhere along the main highways to keep them free from snow.

The principal highways considered by the department at the present time include the Boston-Worcester-Springfield route, the Boston-Fitchburg-Greenfield route, cross state roads to Rhode Island by way of Worcester, and other roads to Greenfield and Fitchburg. Under Commissioner Cole's plan, the state will furnish snowplow attachments which can be fastened to a truck in 20 minutes and truck owners will be asked to cooperate by placing their trucks under the direction of municipal authorities, to be used with the snowplow attachment when requested to do so. Trucks of less than 3 tons capacity will not be heavy enough for this work.

The meeting developed a general sentiment that the state should not depend upon private owners but should furnish the trucks as well as the snowplow attachment, but this Commissioner Cole declared was impossible since the state had not appropriated the necessary money.

"I think," he said, "that I voice the opinions of my associates when I say that we can not consider furnishing trucks as well as snowplows, because we have not the trucks available. With that understanding, and on a basis of the promises that have been made by the various representatives of chambers of commerce and business interests, we shall expect those representatives to submit to us lists of their trucks which will be available or bought with money that will be raised.

"Under that arrangement we will have money enough to furnish snowplow attachments, to supervise the work and to keep in touch with the situation, so that before another Legislature has passed we will be in a position to recommend the enactment of a new law or the amendment of the old."

Representatives present at the meeting included the following: Northampton: Mayor Fitzgerald; Gardner: Selectmen Wiley, H. L. Gustaafson and Representative Frank S. Hartshorn; Marlboro: F. L. Gage, Secretary, Board of Trade; Taunton: Alvin R. White, Director, Chamber of Commerce; Pittsfield: Thomas F. Cosgrove; Webster: L. A. Gilbert, Secretary of the Chamber of Commerce; Lawrence: A. D. Bacheller; Haverhill: H. C. Johnson, Chamber of Commerce; Chicopee: A. D. Phillips; Framingham: Frank W. Meserve, Chamber of Commerce. Others who appeared were Edward G. Stacey, representing the Massachussetts Chamber of Commerce, the Associated Industries of Massachusetts, the Boston Wool Trade Association and the Boston Truck Owners' Association.

The feasibility of the snowplow attachment was questioned by several representatives. Others contended that track owners should bear the expense, since they would be the ones to profit by the plan. Some from the farming sections objected to the highways being kept so clean that it would be impossible for farmers' sleds and sleighs to travel with lumber or other products.

Albert Ennis, representing the trucking firm of Youlden, Smith & Hopkins, suggested that the plows be allotted to trucks which must go over their routes regularly, and assured the commission of the cooperation of a number of trucking firms. He declared that the state should appropriate $1,000,000 to keep the highways open.

Robert P. Marsh, Commissioner of Public Works of Springfield, thought that snow fences on much-drifted highways would make the use of plows almost unnecessary, while without such fences in some sections plows would be of little or no value.

A representative of the Automobile Legal Association urged that something be done to compel the smaller towns to keep their roads open. At the present time, he said, the law compelling them to do so is ineffective.

James M. Lennon, speaking for E. W. Winward & Son of Fall River, a firm operating 30 trucks, promised full cooperation on the routes covered by these trucks.

Mayor Peters has sent to the City Council five vetoes of council orders for the renaming of public squares in honor of Boston soldiers who died on foreign fields. The Mayor stated that he vetoed the measures in each case because they changed the names of squares already named.

The vetoes affected the following squares: The junction of Tremont and Station St., Roxbury, to be Thomas J. Connelly Square, is now known as William Pynchon Square; Linwood Square, Roxbury, to be known as Wlliiam E. Anderson Square; Dearborn Square, Roxbury, to be known as John Charles Peterson Square; Essex St. and Harrison Ave., to Thomas Karen Square, now known as Phillips Square; and the corners of Tremont, Clarendon and Montgomery Sts. to be Jeremiah W. Sullivan Square, now known as Montgomery Square.

The vetoes were filed by the council, which then voted to name the junction of Cedar St., Ford Ave. and Centre St., Roxbury, James M. Hines Square.

Lost, strayed or stolen—Woburn drinking water.

That's what's the matter with Woburn just now. It may not seem a serious thing to some of the anti-prohibitionists, but it is grave enough by this time to have started an official investigation.

William B. Jones, Superintendent of Public Works, thinks that the city water is being stolen. There is a possibility, he allows, that some manufacturing plants are suddenly using an extra supply. But most of the leather factories and tanneries in Woburn are closed now or on short time.

Edward Pollard, City Engineer, has said that from 500,000 to 1,000,000 gal. were missing daily—lost, or stolen or something. Anyhow, he can't tell where the water is going. The situation is puzzling Mr. Pollard—worrying him, too. The pumping station is working overtime, but the big city reservoir on Horn Pond Mountain refuses to fill up over nights the way it used to.

Woburn usually derives its water supply—the purity of which is the city's boast—from a series of artesian wells sunk back of Horn Pond ten years ago. The wells ran low this summer and the city was forced to resort to direct taking from Horn Pond. Now the pond is low.

About a fortnight ago the failure of the reservoir on the mountain to fill up over night was noticed. The full supply in the morning was ordinarily reduced by the normal consumption by water takers. But for some mysterious reason the reservoir fails now to regain its capacity measure during the night.

The fact that more water than usual is being taken is attested by pumping station records. The station meter one day recently showed that 1,700,000 more gallons were pumped on that day than on the corresponding day a year ago.

Through the summer the city has been installing water meters in homes. This work is nearly completed. It was expected that a measured rate system of water payment would cause economy of use and consequent reduction of consumption. This makes the increased consumption all the more puzzling. Samuel Woods, who reads the meters, is taking readings of the big factory meters to see if any increased consumption is shown.

Superintendent Jones has begun a systematic scouting of the brooks and swamps around the city to see if any trace of a leakage or other water outlet from the system of water mains can be found. City Engineer Pollard says that it is possible for a broken main to cause an underground outlet which might not be noticeable at first.

He says: "I believe that water is being stolen, either by tapping a fire pipe or by tapping some other pipe ahead of the meter. If water is not being stolen this way some manufacturing plant may be using far more water than it ordinarily does.

Mayor Golden is cooperating with the water officials in the investigation.

Connecticut has introduced an innovation in the shape of a highway patrol truck designed to meet any emergency which may arise on the roads of that state. This patrol serves a five-fold purpose, carrying equipment for ambulance service, fire-fighting, wrecking, truck weighing and headlight inspecting.

The patrol station is in the center of a district where the greatest number of automobile accidents occur. The crew consists of two men, one mounted on a motorcycle and the other the driver of the patrol. The Motor Vehicle Department has arranged a card which it will distribute to every telephone subscriber in that district, giving information as to how the patrol may be called should an accident occur. The patrol will answer calls in the same manner as does suburban fire apparatus.

The equipment of the patrol is as complete as is possible for emergency work, and is carried in a body carefully planned for the purpose. The ambulance equipment includes two litters with pillows and blankets, Red Cross kit or first aid cabinet, and emergency splints. The litters when not in use are carried in brackets on the outside of the body. The patrol is quickly converted into an ambulance by folding over the side seat cushions into the aisle. The truck has pneumatic tires, making it capable of the speed and easy riding necessary to an ambulance.

Included in the fire fighting apparatus are extinguishers, axe and crowbar, carried in special brackets so as to be quickly accessible. The wrecking equipment includes two 10-ton jacks, two 5-ton jacks, 15 pieces of wood blocking, chains, pinch bars, sledges, wedges, cutting hammers, two ropes and blocks and tackle, together with other necessary tools.

The other two groups of equipment are intended for inspectors of the Department of Motor Vehicles for use in connection with their work in enforcing the state vehicle laws. The truck weighing equipment consists of two loadometer jacks, for use in testing trucks for violations of the weight limit. The other group is for headlight work. For testing headlights, there is a foldling screen, 12 ft. wide and 8 ft. high. In addition the truck carries rubber gloves and wire cutters to handle live wires.

The highway patrol is doing creditable work, though it is still an experiment. Chief Inspector Alden L. McMurtry is well peased with it, and beieves it is only a matter of a short time when the highways throughout the state will be protected.

The Boston News Bureau prints the following:

"The cost of running cities and towns has naturally been compelled to keep step with the higher costs in all other departments of industry. It was inevitable that the tax rate should rise to correspond with the near-to-Boston communities. Belmont and Malden alone are able to report a lower assessment per thousand than in 1919; although of course tangible property valuation was marked up in each instance. Brookline escapes with a slight increase, due to a jump of $7,600,000 in valuation. Milton's rate goes up $5.50, while Newton is boosted $7.40 in spite of a $7,700,000 increase in valuation. Had Newton's valuation remained the same the tax rate would have been increased by no less than $10 per thousand, or over 50%.

"In comparing the new 1920 tax rates of towns and cities in the commonwealth, consideration of course must be given to the valuation of the property taxed, equally with the rate itself.

"The 'weighted average' tax rate for the appended group of Boston suburban communities was $22.75 per thousand in 1919. The 1920 tax rates for the Boston suburban group give a true average of $26.09 per thousand.

"These average rates are obviously figured on valuations which were not the same this year as last year. The 1920 average rate of $26.09 for the Boston suburban group is equal to a rate of $28.39 on last year's valuation. In other words, taxpayers in that group who made average payments of $22.75 per thousand last year, will this year make average payments equal to $28.39 per thousand on the old valuation. This indicates that taxes in this group are 24.8% higher this year than last year.

"Similarly in the list of other Massachusetts cities, taxpayers who paid $22.89 per thousand in 1919, will this year pay an amount equivalent to $29.26 on the 1919 valuation. Taxes for this list of cities will this year be 27.8% above last year's level."

Residents of Highland Ave., Arlington, were given a regular movie thriller the other day when a big steam roller got beyond control of its operator and dashed down a steep incline on the street, finally ending its wild flight by crashing into a house on Massachusetts Ave., where it crushed the front steps, tore a big hole in the corner of the house, jarred dishes from their shelves and shook down the chimney. Charles R. Hooper, the engineer, received an injured leg and a bad shaking up in the ride.

Hooper was running the big roller down Highland Ave. when something suddenly went wrong with the machine and he lost control. Gradually the big machine gained momentum and soon was speeding down the hill at approximately 35 mi. an hour. At the foot of the street it crossed Massachusetts Ave.,

Suburban Cities and Towns

Town or City.	1920 Rate	1919 Rate	1920 Valuation	1919 Valuation
Arlington	$28.90	$27.40	$ 24,092,016	$ 20,357,643
Belmont	24.40	25.50	15,736,691	13,402,099
Brookline	17.30	16.50	103,636,400	96,026,600
Lexington	33.00	26.60	9,945,296	8,966,762
Lynn	27.40	21.70	101,524,882	100,997,667
Malden	29.70	30.50	44,537,127	41,464,840
Medford	29.80	29.40	39,159,850	35,178,600
Melrose	29.50	26.20	21,085,400	20,234,675
Milton	21.60	16.10	21,293,325	18,405,370
Newton	27.20	19.80	86,376,380	78,653,490
Quincy	32.20	28.00	56,493,150	52,332,120
Revere	29.80	25.60	28,537,400	24,993,750
Wakefield	32.70	25.80	13,550,701	13,290,102
Watertown	26.00	23.80	29,385,102	25,544,790
Wellesley	18.50	18.50	18,204,716	16,499,801
Winchester	22.00	20.20	22,211,175	17,836,925
Winthrop	24.50	19.90	18,220,750	16,665,500
Other Cities				
Beverly	20.00	19.20	$ 41,903,615	$ 36,520,120
Chicopee	30.00	21.00	42,718,150	35,122,010
Fitchburg	27.60	24.40	48,072,675	44,900,350
Newburyport	25.00	21.00	11,919,502	11,725,944
Peabody	21.00	18.70	20,623,635	25,268,144
Pittsfield	28.80	23.50	43,755,915	41,957,595
Springfield	24.50	21.20	231,065,270	207,397,380
Woburn	26.00	22.40	16,377,302	13,821,960
Worcester	26.60	22.40	232,004,780	208,040,960

snapped off a telegraph pole and a young tree and bore down on the residence of Richard F. Kelley. Over the lawn it went at breakneck speed. With a roar it smashed through the front steps and into the corner of the house, tearing a big hole where it lodged. It rocked the house on its foundation and dishes were shaken from their shelves, pictures fell from the walls and the chimney came rattling down.

Last month we heard of a loaded 5½-ton tar distributing truck that became unruly and dashed upon a lawn at 6 o'clock in the morning and busted in the foundation of a house and jarred the occupants out of bed, to say nothing of knocking crockery off the shelves and pictures off the walls. No one was injured, however.

Mayor Peters recently notified Timothy W. Kelly President of the American War Veterans' Association of City Employees, that he had accepted on behalf of the city the legisative act-cap. 574 of 1920 that makes new provision for the retirement of pubic service employees who are war veterans.

The association pleaded before the Legislature for the adoption of this act and later presented their arguments to the mayor. The association comprises 1,000 employees in the City of Boston and Suffolk County service. It is about to begin a campaign to double this membership.

The act in question provides for the retirement of city and county employees who are war veterans and applies to all branches of the city and county service except the police department.

The next regular quarterly meeting of the Massachusetts Highway Association will be held at the American House on Nov. 11, at noon.

The principal topic of discussion will be snow removal.

Mr. Ahearn of Arlington and Mr. Johnson of Weymouth will speak on the subject and it is expected by the committee that there will be a representative of the New York City Street Cleaning Department on hand to explain the various methods of snow removal used there during last winter.

New York State Road Builders' Association

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WILLIAM G. FOX, Treasurer .... Saratoga
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C. J. HENDRICKSON .... Syracuse
J. F. PADDELFORD .... Sherburne

Crusher Run

Commissioner Greene participated in the ceremonies which took place when the corner-stone of the suspension bridge across the Rondout Creek was laid. The stone is of Ulster County bluestone, and weighs 1,800 lb. This bridge, when built, will form a link between Albany and New York, and eliminate the old chain ferry, which has plied the waters of the creek very nearly a century.

George D. Williams has associated with the business formerly conducted by Henry B. Brewster, Syracuse, N. Y., under the firm name of Brewster & Williams, Inc. They will be special agents for the sale of contractors' supplies and equipment. Mr. Williams was formerly a division engineer of New York State, and county engineer of Oneida County. Mr. Brewster is an associate member of the New York State Road Builders' Association.

Commissioner Greene has suggested naming the new Jamestown-Fredonia road in honor of the late Assemblyman Hermes L. Ames, of Falconer. The name of the highway will be the "Ames Highway." Mr. Ames did considerable work in furthering this project, and it seems it would only be fitting to commemorate his memory by doing as the Commissioner suggests.

The members of the New York State Road Builders' Association will be pleased to learn of the fact that the Hon. S. B. VanWagenen has entirely recovered from his recent illness, and will soon be able to attend to his road matters. Mr. VanWagenen was taken ill while on his Dutchess County job.

The following were low bidders at the letting which took place on Sept. 28: Rosoff Engineering Co., Suffern Village-Lafayette Ave., Pt. 1, Rockland Co., 0.59 mi., $30,743.50; Rosoff Engineering Co., Suffern Village-Lafayette Ave., Pt. 2, Rockland Co., 0.50 mi., $43,817.00; R. W. S. Corporation, East Islip-Smithtown, Suffolk Co., 9.57 mi., $179,955.20; Lane Construction Corp., Westport-Elizabethtown, Essex Co., 8.85 mi., $271,211.50. There were no proposals on Kaaterskill-Clove, Greene Co., 3.96 mi., nor on Sheridan Boulevard-Burnside Ave., Essex Co., 2.99 mi.

Richard Hopkins, Troy, N. Y., was the second in the bids for the contract to complete the Westport-Elizabeth road in Essex County. His bid was $278,267. Mr. Hopkins was also a bidder at the Chester County, Pennsylvania, letting which took place on Oct. 13. The amount of his bid was $139,779.50.

The following is a copy of a letter sent out to all New York State Road Builders from the New York State Highway Department:

September 29, 1920.

TO ALL CONCERNED:

On Sept. 21, 1920, the Public Service Commission, Second District, held a hearing on the complaint of this Commission regarding the proposed increase in freight rates on crushed stone, sand, gravel, slag and cement, which by its former order had been suspended until Oct. 15.

This is to advise that as the result of the above hearing the Public Service Commission has further suspended the effective date of this proposed increase until Dec. 1, 1920.

You should, therefore, pay no increased freight rates on shipments of the above commodities where the transportation is wholly within the boundaries of this state prior to the last mentioned date.

Very truly yours,
(Signed) IRVING V. A. HUIE,
Secretary.

There are 12 roads advertised in the letting to take place on Oct. 29, 1920. Four roads are completion contracts, and 8 are improvement contracts.

When the 1920 construction program was suspended in April, there were 182 roads under contract. Of these, 25 have been finished, and 78 roads are more than 50% completed. A big program of road building for 1921 has been mapped out, and lettings will be conducted throughout the winter months in order to start early spring work.

Mr. John H. Neafie has been made district manager of the Thew Automatic Shovel Co., succeeded Mr. Harry McLaughlin, deceased.

New Hampshire Good Roads Association

OFFICERS FOR 1920

WINFRED M. CHAPLIN, President	Keene
WM. J. MORRISON, Secretary and Treasurer	Keene
HARRY L. SMITH, First Vice President	Lakeport
OZMAN W. FERNALD, Second Vice President	Berlin

Board of Directors

WILLIAM A. GROVER	Dover
H. W. SPAULDING	Manchester

We have to thank State Highway Commissioner Everett for the following very interesting notes on the activities of his department:

"The work of the department this year has not been all that we had anticipated early in the season. We have found that our maintenance funds were not sufficient to do all that should be done in the upkeep of the roads already constructed. We have, however, endeavored to keep the roads at all times in as good passable condition as possible. We have the usual number of patrolmen but we have not been able to give them all the assistance that they should have had. As a whole the highways throughout the state show more wear than they did two years ago at this time. We have done the usual amount of surface treatment with both asphalt and tar, but the demand for this surface treatment grows each year and no doubt it will be necessary to buy a considerably larger quantity of this material next year than we have ever done before.

"The program for construction as outlined at the beginning of the season was far in excess of anything that has been done before in New Hampshire. Only part of this program has, however, been carried out. Some of the larger projects have been called off until later as it would have been impossible to have built the mileage estimated with the funds available. Some of the more important sections that we planned, however, have been or are being constructed and the end of this season will show probably about 100 mi. of built road added to our system.

"We have completed the Lafayette Road from Hampton to Portsmouth so that we have a continuous highway of modified asphalt surface now from the Massachusetts line to Portsmouth or practically from the Massachusetts line to the Maine state line. This surface is 18 ft. in width with gravel shoulders which have been treated with light oil. This road very much relieves the congestion of the Ocean Road and takes all the heavy traffic from Massachusetts to Portsmouth and all of the through traffic to Maine. We have filled in some of the gaps so that at the present time the road from the Massachusetts line from Tyngsboro to Concord is in very good condition with a hard surface practically the whole length.

"Another important section that is being built is that between West Lebanon and Hanover. This road is called upon to carry very heavy traffic at all seasons of the year between White River Junction and Dartmouth College and is a road which we very much needed. It was originally built of gravel but was practically worn out. The sub-base was clay and during the mud season was impassable. The new road carries a stone foundation practically the whole length of it with a tar penetration macadam surface and is costing some over $40,000 per mile. Numerous other sections are being constructed on our cross state road system, for the most part of gravel. One particularly good section is being constructed on the Central Road from Dover through Madbury and Barrington. This is crushed gravel with a bituminous surface treatment of tar.

"There is some question as to the policy of the state another year in regard to construction, a great many feeling that the regular appropriation should be made but that it be used for maintenance and resurfacing rather than for new construction; they contending that it is most important that the present system of built roads be maintained in the highest state of efficiency possible and that the new construction be deferred until such time as more can be obtained for the money invested than is the case at the present time. It is a good guess that this will be the policy of the State of New Hampshire next season."

Testimony was begun in the Superior Court on Sept. 28 in the damage suit of Mrs. Elizabeth A. Robertson against Fred R. Munroe, et al, selectmen of Hillsborough. The suit is caused from an alleged accident to the plaintiff, which it is claimed was due to cutting down the grade of the street at Hillsborough in front of the home of Judge Holman, she being injured, it is claimed, while driving out from the property by the drop to the new grade.

The suit was first entered against the town in 1916 and has been tried twice in court. One of the defendants, Charles S. Flanders, has since died. It is the first jury trial of this session of the court.

A fire which threatened the Portsmouth, Dover and York Street Railway bridge over Spinney's Creek in Eliot on Sept. 27 was extinguished after a hard fight by a bucket brigade. The fire was discovered by Albert Staples as it was making considerable headway. He fought the blaze from his boat under the bridge.

New Hampshire's vote in the referendum on the Jones-Reavis bill favored the establishment of a department of public works by the National Government, according to an announcement by M. O. Leighton, Chairman, regarding the plans, two of which were approved by the majority national vote and New Hampshire. Each organization cast as many votes as it had delegates at the annual meeting of the chamber, not exceeding ten.

The national vote favored the establishment of a public works department by the Federal Government by a ballot of 827½ to 549½; its establishment by reorganizing the Department of the Interior, changing its name and excluding from it all non-related bureaus and offices, was also approved. The Chamber of Commerce of Concord is also ready to support a plan for the creation of an entirely new department, if necessary, according to Mr. Leighton.

Work has been started upon repairs on the Daniell Bridge in Franklin, so damaged when an automobile ran into it a few days ago that it had to be closed to all traffic on the Merrimack Valley State Road, which crosses it. The structure was inspected by Engineer John W. Storrs of Concord.

John W. Dresser of Franklin has taken the contract to replace the smashed iron post which supported one of the trusses of the bridge.

The automobile at fault, driven by Dr. Lovell H. Preston, of Brookline, Mass., and which was firmly wedged into the broken structure has been placed in the keeping of the Benson Auto Company by Deputy Sheriff C. B. Prescott, who attached the car as security in the claim for damage brought by the city against Dr. Preston. The amount of damage fixed in the writ issued from the office of City Solicitor E. G. Leach is $10,000.

Bids for the erection of the piers and abutments of the Piscataqua River Bridge between New Hampshire and Maine, and also for the erection of the steel structure, were opened recently. Governor John H. Bartlett presided at the meeting and the bids were opened by Commander Brownell of the Navy.

All of the bids were in excess of the figures sought by the commission and did not come within the appropriation of $1,500,000 which the commission has to expend for the structure. At this writing, no action has been taken on the matter, as Governor Bartlett had to hurry to Concord for a council meeting, and Governor Milliken, of Maine, was unable to be present.

The only proposal for the piers and abutments was from the Holbrook, Cabot, Rollins Corporation, of Boston, and was for $830,000. Two bids were received for the construction of the superstructure. One was from the Bethlehem Steel Bridge Corporation, offering to do the work for $928,400, and the second from the American Bridge Co., of Boston, for $1,036,500. The lowest cost at which the bridge could be constructed, according to these bids, would be $258,000 above the amount at the disposal of the ommission.

In the city of Keene the west side of Main Street has recently been rebuilt with about 1,500 yd. of bituminous macadam.

Federal Aid Project No. 36 on the Monadnock Road has been completed and considerable progress has been made on Project No. 94.

Island Street Bridge in the city limits has been posted as unsafe for heavy loads and on Sept. 27. two trucks loaded with machinery disregarded the notice and wrecked two panels of the flooring. The trucks were attached and held until the owners had furnished security to cover the repairs and about two weeks' time was required to obtain new stringers and restore the damage.

Truck drivers pay very little attention to notices on bridges and occasionally they come to grief.

ooo

Officials of the Pennsylvania State Highway Department recently made an inspection tour which lasted three days. At Carlisle the officials were guests of State Highway Commissioner Sadler.

MEETINGS

Calendar of Coming Meetings

Nov. 8-12.—League of California Municipalities.—Annual convention, Chico, Cal. Executive secretary. W. J. Locke, Pacific Bldg., San Francisco, Cal.

Nov. 15-17.—City Managers' Association.—Annual convention, Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York, N. Y.

American Society for Municipal Improvements

The twenty-sixth annual convention of the American Society for Municipal Improvements was held in the Planters Hotel, St. Louis, Mo., on Oct. 12, 13, 14 and 15, with a registration of nearly 350. A considerablle part of the program was devoted to papers and discussions on pavements and the allied subjects of traffic, sidewalks, curbs, etc.

Two amendments to the constitution of the society were passed and will be submitted to a letter ballot. The first amendment proposes to raise the dues of members from $5 to $7.50 and associate members from $10 to $15. The second amendment proposes to regroup the standing committees into four main committees, with sub-committees. The committee on streets will have sub-committees on paving, sidewalks and street design, maintenance and street railway construction. The committee on street cleaning will have sub-committees on street cleaning, refuse removal, snow removal and sewerage. The committee on traffic and transportation will be made a separate main committee. The other main committee will be on city planning.

The salary schedule for engineers in municipal service adopted by the American Association of Engineers was aproved unanimously. The place for the convention next year will be Baltimore, Md.

Officers elected for the ensuing year are as follows: President, R. Keith Compton, Chairman, Paving Commission, Baltimore, Md.; Vice Presidents: E. S. Rankin, Engineer, Bureau of Sewers, Newark, N. J., W. W. Horner, Chief Engineer, Department of Sewers and Paving, St. Louis, Mo., and E. R. Dutton, Assistant City Engineer, Minneapolis, Minn.; Secretary, Charles Carroll Brown, Professor of Civil Engineering, Valparaiso University, Valparaiso, Ind.; Treasurer, Herman H. Smith, Chief Engineer, Bureau of Highways, Brooklyn, N. Y.

A resolution was passed asking Congress to enact legislation enabling the United States to join the Permanent International Association of Road Congresses so that the Fourth International Road Congress may be held in this country.

The specifications for concrete streets, concrete sidewalks and concrete curbs were aproved and will be submitted to a letter ballot. Minor changes were made in three of the present standard paving specifications. These changes will be taken up in a later issue of GOOD ROADS. The report of the "Committee on Standard Tests for Bituminous Materials" was unanimously adopted, as was the report of the "Committee on Traffic and Transportation." Prof. Arthur H. Blanchard of the University of Michigan, is chairman of both of the above committees.

International Association of Street Cleaning Officials

The first annual conference of the International Association of Street Cleaning Officials was held in the La Salle Hotel, Chicago, Ill., on October 7 and 8. The conference was attended by 44 street cleaning officials from 28 municipalities in the United States and Canada.

Membership in the association is divided into four classes; active, associate, honorary and life. Active membership is limited to superintendents of street cleaning departments in municipalities in the United States and Canada and other persons connected with municipal street cleaning departments. Membership of active members continues in case they leave the employ of the municipalities. Associate membership is extended to manufacturers of street cleaning machinery.

Officers elected for the ensuing year are as follows: President, W. J. Galligan, Assistant Superintendent of Streets, Chicago, Ill.; Vice President, Theodore Eichhorn, Superintendent of Streets, Erie, Pa; Secretary, A. M. Anderson, 1340 Old Colony Bldg., Chicago, Ill.; Treasurer, Robert W. Waddell, City Engineer, Kansas City, Mo.

PERSONAL MENTION

J. R. Crissey has resigned as city engineer of Johnstown, Pa.

Karl J. Eisenhardt, formerly Division Engineer of the Indiana State Highway Department, and V. P. Conkey, civil engineer of Evansville, Ind., have organized the firm of Eisenhardt-Conkey Co., specializing in highway and mining engineering.

T. W. Norcross has been appointed chief engineer of the Forest Service, U. S. Department of Agriculture. Since 1916 Mr. Norcross has supervised the construction of national forest roads built with appropriations under the Federal Aid Road Act and the Post Office Appropriation Act of 1919.

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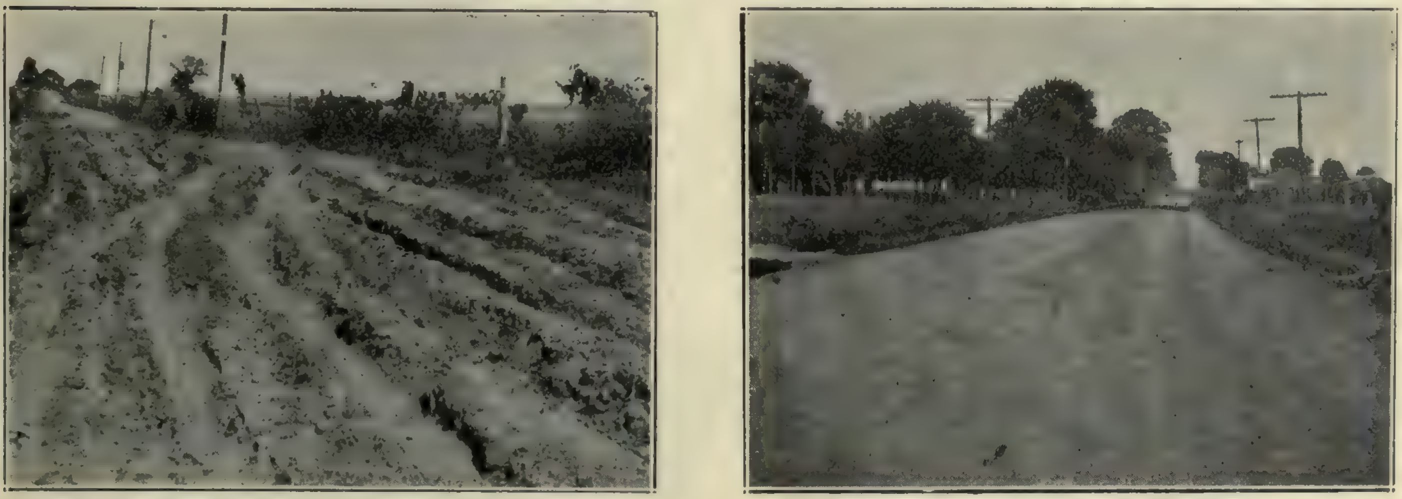
JAMESTOWN, N. Y., NOVEMBER 3, 1920

Number
18

The Peoria County Dirt Road Improvement Association

By LOUIS A. WILSON*

In our enthusiasm for improving the highways with hard surfacings, we are prone to overlook the fact that the dirt road is, after all, the road upon which the greater part of our vehicles must pass. While a very small annual expenditure will keep the dirt roads fairly well maintained, the greater part of them are in a bad condition a considerable part of the year.



A Tyical Road Before Improvement

A Stretch of Road After Smoothing

TWO ROADS IN PEORIA COUNTY, ILLINOIS—SHOWING WHAT IS BEING ACCOMPLISHED BY THE EFFORTS OF THE DIRT ROAD IMPROVEMENT ASSOCIATION

Probably one of the most promising road movements in the country was started several months ago when citizens of Peoria County, Illinois, organized the Peoria County Dirt Road Improvement Association. This association arises as the result of the curtailment of the Illinois program for building hard roads. Because of the greatly unsettled conditions in road building, the extension of the system of hard roads in that state is naturally retarded. Also, many county roads can not possibly be paved for a good many years, for it will take a long time to first pave the main arteries of travel. With these facts in view, citizens of Peoria County have formed an association which has for its purpose keeping in good shape the roads which already exist, properly maintaining the many miles of earth roads in the county.

S. K. Hatfield, now president of the association, and M. M. Baker, Manager of the Holt Manufacturing Company, Peoria, Ill., formulated a plan of action in launching the movement. Mr. Baker agreed to furnish several "Caterpillar" tractors and Mr. Hatfield agreed to exercise general supervision of the work. The work is being done by the townships, each township providing a grading machine and the necessary funds to pay for labor and the operating expenses of the tractor. In this way each township receives direct benefit of its financial subscription to the movement.

To perpetuate the movement and to provide for the continual upkeep of the roads after they are once

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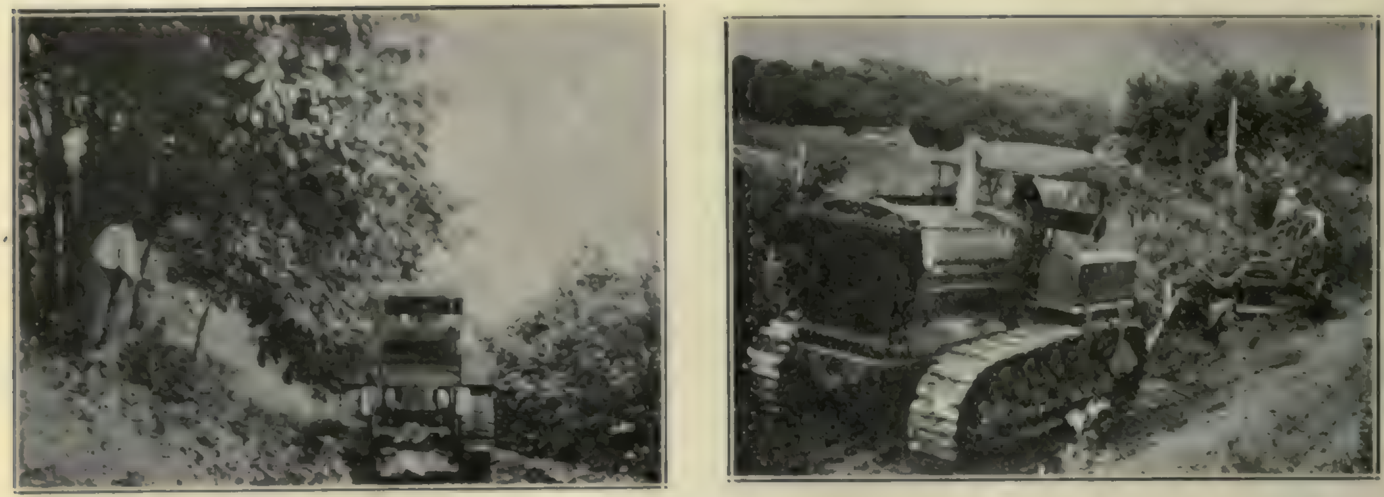
*Holt Manufacturing Company, Peoria, Ill.



Removing Trees

Hauling a Grader

UTILIZING A "CATERPILLAR" TRACTOR IN ROAD WORK IN PEORIA COUNTY, ILLINOIS

graded, the townships have agreed to thereafter maintain the roads.

At the present time the "Caterpillars" are at work in the Kickapoo and Timber Townships. The work in the Timber Township is of particular interest. The road on which work is now being done is a bottom road, winding around the foot of the Illinois River bluffs. Before grading could be commenced, it was necessary to clear the brush and trees from along the right of way. The accompanying illustrations show the true nature of the task in converting these lanes into good roads.

Trees from 6 to 24 in. in diameter were pulled out by the tractor, after which a blade cutter was used on the sidehills preparatory to widening the road from 8 ft., its former width, to 24 ft. with a 12-in. crown. With proper maintenance these new roads, which were barely more than cowpaths before, will do much to promote the welfare and progress of the communities connected by them.

On Oct. 2 Timber Township had completed 25 mi. of earth roads under the auspices of the Peoria County Dirt Road Improvement Association. The Holt Manufacturing Co. furnished the tractors and bore the items of depreciation, repairs, etc., on the machines, amounting to $64.87.

The 25 mi. of road were divided into two sections, one road 17 mi. and the other 8 mi. long. The total cost of improving the first section was $1,225.03, including cost of labor and material for culvert construction of $478 and operation of two "Caterpillar" tractors and graders. This makes the cost per mile $72.06. The total cost of improving the other section was $727.45, a cost per mile of $90.95.

The Board of Supervisors of Peoria County has appropriated $40,000 for road work next year, and will continue the movement inaugurated this year. It is probable that tractors and grading machinery will be purchased which may be used by the townships in road work. Because townships in Illinois are authorized to levy amounts which are seldom more than $3,500, road improvement is hampered unless the county supplies the heavy and expensive equipment. By relieving the townshp of the burden of purchasing this heavy equipment, the way is opened for the purchase of lighter maintenance equipment.

May Convert Ohio Canal Into Highway

Plans for the conversion of the Ohio Canal between Akron and Cleveland into a highway are being discussed by civic bodies of municipalities situated along the canal. It is proposed that the water in the canal be run through large conduits so as to serve as a sewer and that the land occupied by the canal bed and banks be converted into four traffic lanes.

New Jersey Prepares 1921 Road Program

Will Spend $4,500,000 on Bridge and Highway Work During Coming Season

The New Jersey State Highway Commission has approved a program for highway construction in 1921 calling for an expenditure of $4,500,000. About $1,500,000 of this amount will be spent on the Amboy Bridge. The program also includes the completion of the Rahway-Elizabeth Road and the Ancora-Atco Road; paving from Berlin to Absecon; paving sections at South Amboy and Keyport; construction of the road from Red Bank to Eatontown; the road from Hackettstown to Budd's Lake, Sussex to Unionville and the highway in Morris County from Parsippany Corners to the county line. A number of bridges, which are said to be in poor condition, will be repaired or rebuilt.

A resolution petitioning the governor to double the number of motor vehicle inspectors was passed by the commission. It was also recommended that the salaries of the state motor vehicle commissioner and motor vehicle inspectors be increased.

George L. Burton was selected permanent chairman of the commission.

Relation of the Proposed Uniform Vehicle Law to Municipal Traffic Regulations*

By H. G. SHIRLEY†

In drawing the proposed uniform vehicle law, a thorough study was made to determine how far it should go in the regulation and control of traffic in municipalities, as it was realized that special traffic control is necessary and should be provided in large centers of population. For this reason, only the basic provisions that should govern traffic throughout the state were made state-wide. And in arriving at these provisions, careful consideration was given to the effect that they would have on the safe and expeditious handling of traffic and the good that would come from them.

In the earlier days of motor legislation, each district, town, municipality and county specified certain speeds, loads, kind of tires, lights, signals, etc., and, each having different requirements, the result was a mass of laws and ordinances which made it impossible to operate a vehicle without violating many of them. Under these conditions, certain abuses were practiced. Low speed limits were established and upon the arrest of offenders heavy costs and light fines were imposed. The costs were divided between the arresting officer and the magistrate and a very profitable business was established, while the fine that went to the town or village was exceedingly small. This alone made it imperative to have a uniform speed limit throughout the state.

In drawing the proposed law, it was specified that no license fee other than the one paid to the state should be levied against any vehicle, with the exception of the tax levied on all property. A minimum rate of speed was specified for open country, for suburban sections and for urban sections, municipalities being left the right to increase this limit, but under no condition to decrease it. This was done because a study of the ordinances of the larger centers of population showed that on certain boulevards a higher rate than that proposed was permitted.

The provisions proposed as state-wide cover license fees, signal devices, brakes, load plates, lights, speed, weight, length, width and height.

The license fees are based on the horse power, plus a charge for each 100 lb. of gross weight of the vehicle and load, pneumatic tired vehicles being on a basis of 50% lower than those with steel tires.

It is provided that every motor vehicle shall be equipped with a signaling device for producing an abrupt sound as a signal or warning.

It is provided that two sets of suitable brakes, operating independently, shall be provided. It is also provided that every vehicle shall be equipped with a load plate giving the actual weight of the vehicle, with equipment, and the weight of the seating or loading capacity, as specified by the manufacturer.

The provisions in reference to lighting require that all vehicles shall be provided with lights of sufficient power to enable the operator to proceed with safety to himself and other users of the highway. Every vehicle must have a lamp on either side in front. If the vehicle is so constructed, governed or controlled, that it cannot exceed a speed of 15 mi. an hour, the front lamps must be adequate to render any substantial object clearly discernible on a level road at least 50 ft. directly ahead, and at least 7 ft. to the right of the axis of the vehicle, at a distance of 25 ft. If the vehicle can exceed the speed of 15 mi. an hour, the front lights must be adequate to render any substantial object discernible on a level road at least 200 ft. directly ahead and at the same time at least 7 ft. to the right of the axis of the vehicle at a distance of 100 ft. It is also provided that no front lamp equipped with a reflector shall be of more than 4 cp., unless it is so arranged that no part of the beam of light when projected 75 ft. or more ahead of the lamps shall rise above a plane 42 in. higher than and parallel with the level surface upon which the vehicle stands. It is further provided that no light of more than 35 cp. shall be used no matter how it is shaded, covered or obscured.

The speed limits for vehicles designed for carrying not more than seven passengers and of a maximum weight (gross weight of vehicle and load) of 6,000 lb. are 30 mi. an hour on open country highways; 20 mi. on suburban streets; and 15 mi. on urban streets.

The limits for other vehicles equipped with pneumatic tires are 25 mi. an hour on open country highways; 20 mi. on suburban streets, and 15 mi. on urban streets.

The limits for vehicles equipped with solid tires vary with the weight as shown in the following table:

Weight (lb.)	Miles per hour		
	Open country highways	Suburban streets	Urban streets
4,000	25	20	15
8,000	20	18	12
12,000	18	15	12
16,000	16	15	12
20,000	15	15	12
24,000	15	15	12
28,000	15	15	12

Except by special permit it is forbidden to operate

(Concluded on Page 218)

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*Abstract of a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12 15, 1920.

†Secretary, Federal Highway Council.

Compression Tests of Concrete from Roads in Sacramento County, California

By R. M. MORTON*

During the past two and one-half years about 100 mi. of concrete pavement have been laid in Sacramento County, California. The work has been done by means of a county bond issue of $1,750,000 under the direction of the Sacramento County Highway Commission, the present members of which are F. B. McKevitt, W. S. Caruthers and R. C. Irvine, all of Sacramento. The completion of the final 13.5 mi. of pavement has been delayed because of difficulties regarding the routes, notwithstanding which Sacramento County now has about 225 mi. of improved highways within her borders. The planning and construction of the recent system of concrete highways was under the supervision of R. M. Morton, Assoc. M. Am. Soc. C. E., as chief engineer.

TABLE I—AVERAGE SAND GRADINGS

	Total percentage passing sieve numbers:								
	200	100	80	50	40	30	20	10	¼
1—Yuba River	.24	1.75	3.00	17.30	41.80	64.90	87.50	95.40	100.00
2—Consumnes River	.30	0.80	1.80	6.70	14.70	32.20	70.70	95.40	100.00
3—American River	3.20	6.60	7.90	17.30	28.00	41.50	58.30	80.80	100.00
4—Natomas washed screenings	1.10	4.20	5.90	20.20	48.80	53.30	76.50	90.70	100.00
5—Sacramento River	1.70	2.00	4.40	11.30	24.80	42.50	71.40	91.10	100.00
6—Enwood	0.15	0.30	0.45	1.60	1.80	11.70	29.80	63.60	100.00

TABLE II—DATA ON SAMPLES TESTED

Road	No. of Samples	Age in days	Average height	Average density	Average break	High break	Low break	Sand used
*Marysville	9	243-585	4 1/3	2.355	2,755	4,236	2,140	1
*H Street	19	426-707	4 9/38	2.489	3,697	4,541	2,700	3
*Fair Oaks-Greenback	4	545-638	5 1/16	2.360	2,943	3,418	2,370	4
*Greenback Lane	8	580-770	4 6/64	2.305	3,211	3,823	2,765	1 & 6
Jackson	27	29-369	4 71/216	2.411	3,360	4,384	2,390	2
*Florin-West	2	585-599	3 15/16	2.35—	2,632	2,680	2,610	1
*Florin-Perkins	4	543-640	4 1/16	2.55+	3,077	3,974	2,580	1
*Elk Grove-Franklin	4	605-732	4 1/16	2.42+	3,233	3,700	2,990	1
*Elk Grove-Sheldon	5	550-655	4 7/20	2.477	2,776	3,145	1,635	1
*Lower Stockton	8	149-665	4 19/64	2.370	3.057	3,222	2,880	1
*Galt New-Hope	7	68-659	4 1/8	2.384	2,841	3,635	2,230	1
Clay Station	7	20- 78	3 47/56	2.513	2,895	3,522	2,579	1
*Freeport	6	539-701	4 1/4	2.432	3,613	4,609	3,201	1 & 6
*Rendle Island	4	593-615	4 7/32	2.472	2,602	2,925	2,295	6
District 744	7	64-129	5 11/56	2.395	2,747	3,757	2,201	5
Grand Island	21	57-373	5 2/21	2.32	2,244	2,955	1,700	5
*Pocket	6	307-418	4 1/4	2.43—	2,973	3,781	2,640	1

*Machine tamper used.

Practically all of the concrete base pavements were constructed to a width of 15 ft., and 4 to 5 in. in thickness. The mixture of concrete used was in the proportion of 1 part of cement, 2½ parts of sand and 5 parts of rock. Excellent materials were generally available for construction. Much of the sand was shipped from the Yuba River and consisted of clean white quartz sand of fair grade. The rock generally used consisted of crushed cobbles, obtained in Sacramento County from the plant of the Natomas Co. of California, usually graded to form a special concrete mixture. The rock ranged from ½ in. to 2½ in. in size, with crushed and uncrushed gravel in about equal proportions.

The cement used was obtained from the Henry Cowell Lime and Cement Co., of San Francisco, and is an excellent grade of hydraulic Portland cement.

Typical sand gradings of six varieties of sand used on the work are shown in Table I.

In the spring of 1919 the idea was conceived that a series of compression tests on samples cut from the pavements already installed, some of which had been in use nearly two years, might furnish interesting information to highway engineers generally, as well as data upon which to base conclusions regarding the strength which might be expected from field concrete of the type used. The pavements were unsurfaced and without exception were resisting the traffic in a highly satisfactory manner. Arrangements were perfected with the California State Highway Commission to obtain the use of a Calyx core drilling machine mounted on a motor truck, which outfit had been built by the commission for the purpose of sampling concrete pavements. This outfit cuts a clean core 4½ in. in diameter.

The machine was obtained in April, and sent out over the various roads in charge of one of the

(Continued on Page 218)

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*Chief Engineer, San Diego County, California.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX NOVEMBER 3, 1920 No. 18

DIRT ROAD IMPROVEMENT

There is nothing new in pointing out the importance of the ordinary dirt roads and urging that more attention be given to improving them and keeping them in the best possible condition. Everybody—or almost everybody—realizes that by far the major portion of the country's highway system consists of unimproved, or but slightly improved, earth roads and that they carry a large part of the traffic, especially in foodstuffs and other basic commodities. It is generally realized, too, that these roads must continue to serve many sections for a long, long time, because their mileage is so enormous that funds for their betterment cannot be secured in the immediate future. In spite of this almost universal appreciation of the dirt road problem, however, it is undoubtedly true that, as pointed out elsewhere in this issue, "In our enthusiasm for improving the highways with hard surfacing, we are prone to overlook the fact that the dirt road is, after all, the road over which the greater part of our vehicles must pass."

In the article from which the foregoing is quoted, "The Peoria County Dirt Road Improvement Association," the author describes the efforts that are being made by one group of citizens to put their dirt roads into passable condition and keep them so through as much of the year as they can.

It is hardly possible to make a 365-day highway out of an earth road. In the northern portion of the country at least, there will be a period during the spring when the road will be soft. But if the road is in good condition when winter sets in, and if it is promptly and properly taken care of when the frost comes out, this period can be kept down to a surprisingly short length. A silk purse cannot be made of a sow's ear nor an all-year boulevard of a dirt road, but by grading, draining and dragging, even a poorly located and carelessly constructed earth road can be made to render remarkable service.

The example of Peoria County, Illinois, is worthy of general emulation.

MOTOR TRUCKS FOR RURAL AND SUBURBAN DELIVERIES

Merchants so situated that they have large rural or suburban areas for potential markets have always faced a somewhat perplexing delivery problem. Many of them have now solved it by utilizing motor trucks—incidentally increasing the area in which they can do business and also reducing their delivery costs in many instances. One example of this is cited on another page of this issue.

As road improvement progresses the advantages of motor truck deliveries will increase. Better roads radiating from cities and towns will permit more rapid and less costly deliveries. Lower delivery costs will sooner or later be reflected in lower prices to the consumer.

And this is only one of the ways in which good roads can help cut the cost of living and make residence outside of cities more attractive.

A UNIFORM MOTOR VEHICLE LAW

Among all the matters on which uniformity in the relevant laws of all the states is desirable few are so necessary as that of motor vehicle regulation.

The average citizen needs very little knowledge of the laws of any commonwealth except that of which he is a resident. The motor vehicle laws, however, form an exception, for very many automobile owners drive in more than one state. This is particularly true of residents of places near state lines and of those who live in the East where the areas of states are comparatively small and an ordinary day's trip may carry the driver into three or perhaps four different ones, in each of which the laws are different in some details.

These details cover both car equipment, as in the matter of lights, and the operation of the vehicle. In the former case, conflict with some of the statutes is practically unavoidable. In the latter, the violation of regulations can be guarded against only by a thorough knowledge of the regulations of each state entered, and sometimes of cities and towns that are permitted to make local regulations.

Elsewhere in this issue is printed a paper discussing the "Relation of the Proposed Uniform Vehicle Law to Municipal Traffic Regulations." The paper was prepared for the recent A. S. M. I. convention by Secretary Shirley of the Federal Highway Council, and it describes in some detail the provisions of the proposed measure. It is not the purpose to comment here on these provisions, but merely to emphasize the urgent need of uniformity in the different states. A mediocre law of nation-wide application would be preferable to a mass of conflicting laws in the several states, even though some of them were far better than anything that could be agreed upon by all of the legislatures.

Relation of the Proposed Uniform Vehicle Law to Municipal Traffic Regulations

(Concluded from Page 215)

upon the highways any vehicle with four wheels or less, the gross weight of which, including the load, is more than 28,000 lb.; any vehicle having a greater weight than 22,400 lb. on one axle, or any vehicle having a load of over 800 lb. per inch width of tire upon any wheel. It is also forbidden to operate any vehicle of a length of more than 30 ft. or any combination of vehicles coupled together, the length of which, including the load, is more than 85 ft., except by special permit. It is further provided that no vehicle shall be operated on the highways if its width, including the load, is greater than 96 in., except traction engines, the width of which must not exceed 108 in. The height is limited to 12 ft. 6 in.

The main object of the law is not to restrict, but to expedite the handling of traffic and to protect property and life. Familiarity with such a law would enable a driver to operate a vehicle in any town or city without knowingly violating any of its provisions and in time would greatly expedite the movement of vehicles.

It should be clearly understood that the law is not intended to interfere in any way with the handling of traffic by traffic officers in large ities. That problem is of the greatest importance and means much to the welfare and progress of municipalities. It is intended, however, to make it possible for a man traveling from one town to another to avoid violating the common law that should be known by every driver. The law applies to horse-drawn vehicles as well as to motor-driven vehicles, and its enforcement should be in the hands of the police of the state, outside of municipalities and cities, and in the hands of the police of cities, within municipalites.

In drawing the proposed law, the framers kept in mind the necessity of making it as simple as possible in order to facilitate its adoption by the legislatures of the different states.

On a highway carrying 3,000 vehicles per day—and we have many carrying many times this number—if traffic officers were placed at cross traffic points, averaging four to the mile, and at each one of these points one quarter of a minute could be saved each vehicle, the total saving at all four points would be 1 minute per vehicle. For 3,000 vehicles this would amount to 3,000 minutes, or 50 hours per day. This saving, at $3 an hour, would amount to $150 per mile per day, not counting the saving of time to the occupants of tne vehicle. If each vehicle carried two persons besides the driver, and their time was worth $1 an hour, the saving in time would amount to $100 per day, which, added to the previous figure, would make a total saving of $250 per mile per day. Multiplying this by 300 days would give a saving of $75,000 per mile per year, less the cost of maintaining traffic officers, which would not exceed $15,000 per year, thus leaving a net saving of $60,000 per year due to proper control of the traffic. Multiplying this by the many miles of important highways would show an enormous saving. We are informed that in the city of Chicago, traffic is moving only about one-third of the time. If by expert handling a small percentage could be added to this moving time, many millions of dollars would be saved to the city.

Compression Tests of Concrete from Roads in Sacramento County, California

(Continued from Page 216)

assistant engineers of the commission. On most of the roads the instructions were to obtain random samples about once in every mile. In several cases where unusual conditions during construction had been encountered additional samples were to be obtained at locations designated.

During April and a part of May a total of 148 samples were taken, the average being about 8 per day. The time for cutting each sample varied from 10 to 40 minutes. Concrete made with Yuba River sand and Natomas rock averaged from 20 to 30 minutes per sample. The amount of No. 9 chilled steel shot used per sample averaged 2.4 pounds.

It is to be regretted that the samples obtained did not have sufficient height, owing to the pavement thickness, to make the ratio of the height to the diameter the standard 2:1, and without doubt the breaking strengths found are higher than would have been found if the samples had conformed to this ratio. The results in Table II. are believed to be from 16 to 40% greater than would have been the case if the breaks were made on standard sized samples.

The table shows the name of the road from which the samples were taken, the number of samples, the range of their age in days, their average height, the average density of samples on each particular road, and the average compression required to break the samples. The average compression of all the samples was 3,030 lb. Thirteen samples broke above 4,000 lb., the highest being 4,609 lb.

Considerable variation in compression strength was noted as the result of these tests on samples taken from pavements similar in materials, workmanship, amount of water, etc. This variation is not accounted for, but would seem to indicate that close regulation of equipment, labor and materials is necessary to produce a concrete of uniform strength. Most of the pavements from which these samples were taken were automatically tamped by means of an early type of road tamper and finisher, but the results do not show that the concrete finished with the tamper possesses any greater strength than that which was tamped by hand. Judging from the structure of the broken samples, the machine tamped concrete seems to contain more rock particles than the hand tamped.

Allegheny County, Pennsylvania, Defers Vote on Road Bond Issue

The County Commissioners of Allegheny County, Pennsylvania decided not to submit the proposed bond issue of $35,000,000 for roads, bridges and court house improvements to the voters at the general election. The reasons given by the commissioners for this action were that sufficient time had not been allowed for the voters to acquaint themselves with the provisions of the measure and that the bridge item should be separated into two groups, placing in one the question of new bridges and in the other the question of replacing old structures as ordered by the Secretary of War.

Capillary Movement of Water in Soil

Bureau of Public Roads Conducts Tests Which Throw Light on Subgrade Problems

While capillary action of water has for a long time been recognized as the probable cause of many subgrade failures, very little investigation has been conducted on the subject and knowledge of the behavior of water in soil is limited. The U. S. Bureau of Public Roads at the present time is investigating the problem from several angles in an attempt to gather data that will be of value in arriving at a clearer conception of the requirements of highway subgrades that will support the pavement. Bulletin No. 835, entitled "Capillary Movement of Soil Moisture," by Walter W. McLaughlin, has recently been issued by the Department of Agriculture, and while written from the standpoint of an irrigation engineer, the results are of considerable interest to highway engineers.

The soils to be tested were placed in flumes, one side of which was of glass to permit the observation of the moisture movement. It was found that temperatures from 26° to 32° F. have great effect upon soil moisture, other than that of freezing. For these temperatures a greater percentage of moisture existed consistently near the top of the flume than near the bottom. Basicly the percentage of moisture in the top samples should be less than that in samples from the bottom, for gravity tends to draw the moisture to the lower levels and evaporation tends to reduce the moisture content of the surface soil. Thus is offered a possible explanation of the saturated condition of highway subgrades in the spring of the year.

Tests on the vertical movement of water in soil show that the rate of movement in the lighter soils is more rapid for the first few hours, but that the lighter the soil the shorter would be the distance the moisture would move upward in a long period of time. In the horizontal movement of moisture the rate of movement is reversed. The light soil with the lowest moisture equivalent showed the greatest movement of moisture, whereas the heavy soil with greatest moisture equivalent showed the least movement of moisture. The lighter soils used the greater total quantity of water in long periods of time and moved it farther in the horizontal direction than did the heavier soils. This would indicate that the horizontal movement of water from road shoulders toward the center of the pavement must be fully as great as the upward movement of water from underground sources.

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Ashtabula County, Ohio, is planning to erect two bridges, one at Ashtabula and the other at Conneaut. An expenditure of $1,300,000 is estimated to be necessary for the construction.

A Bridge between El Paso, Tex., and Mexico, spanning the Rio Grande River, has been proposed by El Paso citizens. The bridge will cost about $100,000 and it is suggested that El Paso, Mexico and the United States each pay a third of the cost.

The New Jersey State Highway Department will lay iron conduits every 200 ft. under the roadway of future state highways constructed in municipalities. This action was taken so that, as houses are built, gas and water mains can be connected through the conduits, instead of tearing up the pavement.

Rice Growers near Beaumont, Tex., have obtained a temporary injunction restraining contractors from closing the road between Beaumont and Amelia. The road is to be paved, but rice growers object to the work being done at this time because the crop is beginning to move and the highway is needed to bring the rice to the Beaumont mills.

New York Will Resume Highway Work

State Highway Commissioner Greene of New York has announced that highway construction will be resumed and that an elaborate construction program for 1921 has been prepared. Bids on 12 projects were received on Oct. 29, the first since April last.

Motor Vehicles in Japan

A recent census of motor vehicles in Japan indicates that in Tokyo there are 9,000 such vehicles; in Osaka, 800; Kanagawa, including Yokohama, 650; Hyogo, including Kobe, 500; Kyoto, 350; Nagoya, 400; Fukuoka, 200; Shidzuoka, 150; and several hundred more in other prefectures in the country.

Highway Work in Philadelphia

The Department of Public Works of Philadelphia, Pa., has announced that during the first nine months of the present year, 14 mi. of streets have been graded, constructed or reconstructed. In addition, $727,000 has been expended in repair work. At present there is pending in the City Council an ordinance providing $252,200 for repairing and resurfacing streets.

Signs of Increased Labor Efficiency.

Increased willingness of labor to do a full day's work was recently graphically described by an Italian contractor, according to John M. Cole, State Commissioner of Public Works of Massachusettts.

"Today I say to the workman," the contractor said to the commissioner, " 'You take that pick and dig or I smash your head.' Before, when I tell him to go to work, he say, 'You shut up or I smash your head.' "

Unusual Road Problem in Northwest

Drifts of Volcanic Ash Along Columbia River Highway Sprayed with Oil to Stop Sand Dunes Forming and Blocking Road

In the construction of 53 mi. of the Columbia River Highway from che Dalles, Ore., eastward, considerable difficulty was encountered in shifting sand dunes which cover up the highway soon after it is completed. The soil in this section is sandy and in many places there exist deposits of volcanic ash as light as flour. As fast as cuts are opened up and fills made in this light soil, the wind whips out the fill slopes and sand dunes creep into rock cuts, completely blocking the road. Oil is the only agency yet found to step the trouble. The equipment used to spray the crude oil consists of two supply tanks in which the oil is carried from the storage tank at the railroad siding, and a tractor, which draws the oiling rig and supplies the pressure to the oil. The oil is heated and forced through a hose with a nozzle consisting of a ½-in. pipe. Steam is passed through with the oil and the atomized oil is sprayed for 100 ft. or more, depending on whether the spray is projected with or against the wind. Where sufficient oil is used. this means of controlling the sand dunes is very effective.

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The Minnesota State Highway Department is making a preliminary survey of shale and clay deposits in the state, with a view to establishing state owned cement and paving brick plants.

Ironwood, Mich., will construct a viaduct over two railroads at an approximate cost of $200,000. The city will bear one-fourth of the cost and the railroads the remainder. Construction will be start-next spring.

Farmers near Endicott, Wash., recently loaned Whitman County $45,000 to construct about 2 mi. of macadam highway from the city limits to the city rock quarry. The county and adjoining property owners each pay half of the cost of construction.

The Massachusetts State Registrar of Motor Vehicles revoked or suspended the licenses of 63 motor vehicle operators on Oct. 1. During the past five months the licenses of 1,116 drivers in that state have been suspended.

Bill Posting on the Highways of Pennsylvania being unlawful, State Highway Commissioner Sadler has cautioned election campaign managers against placing advertising cards on poles or within the limits of state highways.

Women's Clubs of Delaware County, New York, will beautify the highway between Hobart and Delhi, a distance of 20 mi., by planting trees along the roadside. State Highway Commissioner Greene has signified that he will aid the women's clubs in the work.

San Bernardino County, California, has passed an ordinance limiting the weight of vehicles on county highways to 10 tons. The weight on tires of trucks was set at 750 lb. per inch of any pneumatic tire, 650 lb. per inch for solid tires and 600 lb. per inch on steel tires.

Tate County, Mississippi, has suspended any further road improvements because of lack of funds. Last fall the county sold $300,000 of road bonds with the understanding that the State Highway Commission would add $150,000. Later this offer was withdrawn and the county did not get the expected assistance from the state.

HIGHWAY TRANSPORTATION

Department Store Increases Business Area and Profits by Motor Trucks

The territory covered by any particular store is generally limited to an area wherein reasonably prompt deliveries may be made. If a company can make a daily delivery within a radius of 5 mi., this area is their business area. If a company is desirous of securing more business, it must either increase the volume of trade in its business area, or extend the area.

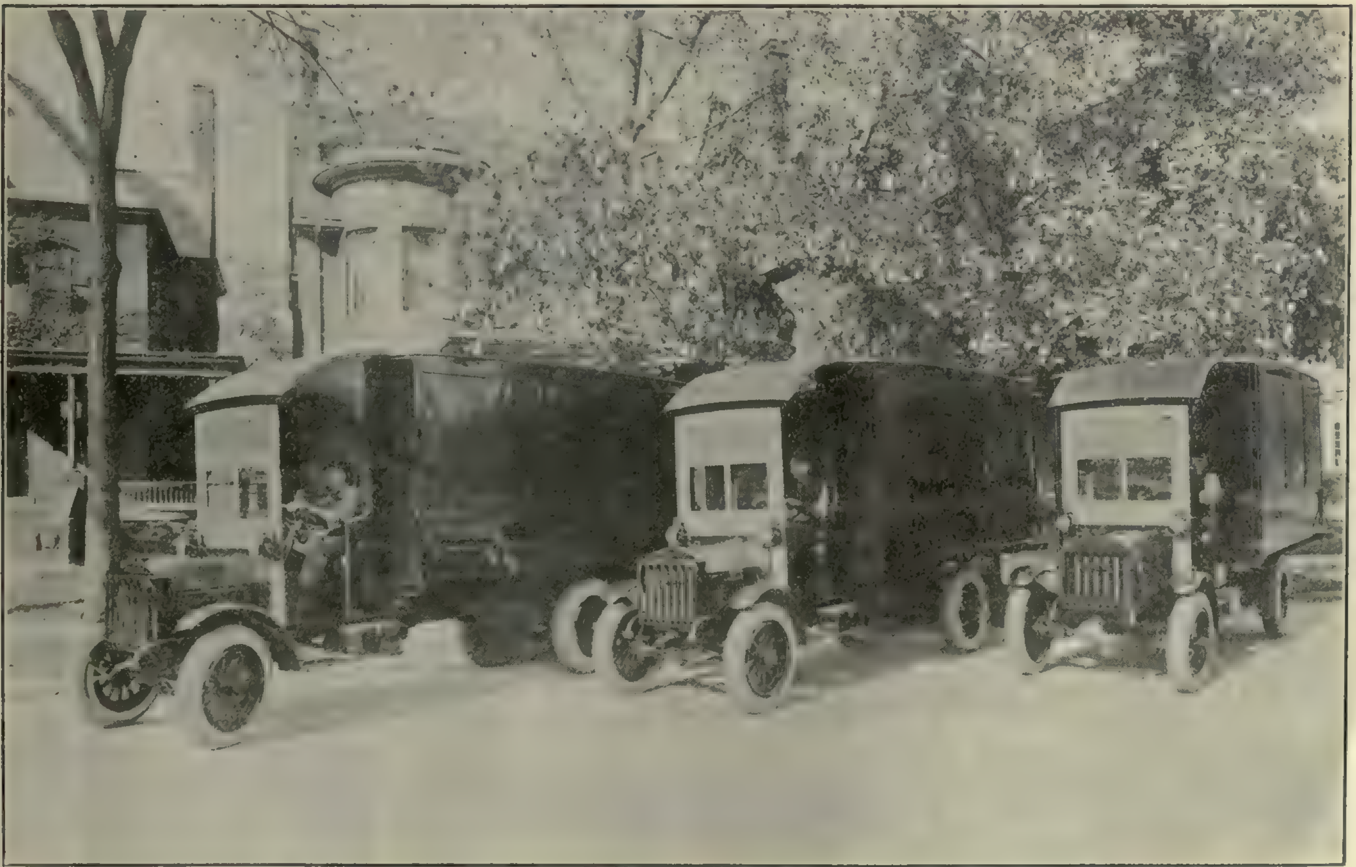
The problem of furnishing a delivery system that will be satisfactory, both as to cost and time, in order to increase the business area, can be solved, and a good instance is found in Detroit, Mich., in the department store of the Crowley-Milner Co.

This company recently instituted a delivery system furnishing service twice weekly to 15 outlying towns, and all farms and intermediate points within a radius of 25 mi. This service is furnished by Federal motor trucks. The territory has been divided into routes, each route approximately 60 mi. long. However, the cross-road traveling necessary to deliver parcels to customers living off the main road often increases the distance covered by these trucks to 75 mi.

The fact that the Crowley-Milner Co. advertises and makes free deliveries to any farm within the greatly increased business area, naturally results in increased business and increased profits. The routes and system of delivery were carefully planned and organized so that no truck covers unproductive territory and maximum delivery is secured.

Motor Trucks Make 150-Mile Deliveries

Signs made in New York City are often shipped to points 150 mi. away by means of motor trucks by Strauss & Co., New York City, manufacturers of signs. Many of the large electric signs in Boston, Worcester, Philadelphia and Atlantic City have reached their destination by means of motor trucks. By making its own deliveries, this firm saves considerable time, expense of crating and shipping, besides reducing breakage to a minimum. A further saving is effected in the railroad fare of the workmen who must travel to place the signs, and since the truck carries along the tools of the workmen, delay in the work is avoided. Many of the large electric signs are rented and any delay in installing them means a loss to the manufacturer.



FLEET OF FEDERAL TRUCKS USED FOR LONG DISTANCE DELIVERIES BY THE CROWLEY-MILNER CORPORATION, A DETROIT DEPARTMENT STORE

The Evils of Overloading

By ROBERT O. PATTEN*

For many years the appeal has been made by the makers of motor trucks to load the vehicle to its rated capacity. It is a discouraging fact that in many instances this advice has been disregarded, with the result that the motor truck industry has been injured. The cure for the evil of overloading does not apepar to be immediately in sight, but experience, coupled with expense, is a great teacher, and there are hopeful signs for the future.

Just how has this condition of overloading become common practice and been permitted to grow? The burden in this respect should not be thrown entirely upon the truck owner. In many instances the enthusiastic and more or less ignorant salesman has made extravagant claims for durability and excess capacity, which have later on been carried out in practice by the owner. Then, again, competitive haulage—especially on a tonnage basis—has been an incentive for the owner to overload his truck, with the idea that he was receiving an increased revenue for so doing. Whether the owner needed much urging to bring him into the class of overloaders is a question, but the fact remains that there are many cases of this kind, with very little being done to stop it.

Motor truck owners' attention should be directed to the fact that a motor truck may be compared to a bridge, both structures being built with clear engineering thought of the capacity of load they will safely and economically carry. It is a common sight to see a bridge placard notifying the public that the capacity of the bridge is safe for a certain tonnage. It is a rare thing to see the same caution used with a motor truck, and still both are instruments for carrying weight.

It is generally a fact that those who are most prone to seriously overload are also guilty of the other evils of truck operation, viz., overspeeding, lack of lubrication and general lack of proper upkeep. It is usually found that the overloader keeps his equipment in mighty poor shape, and is quite consistent in his bad business practice. In fact, the serious overloader is gradually being placed in the undesirable class by truck dealers, because this type of user is too expensive to service.

In conference with many of the largest truck operators in various lines of business all over the country, their views, based upon years of experience, lead them to state that overloading does not pay. It may be invited in temporary instances, but continuous practice invites inevitable loss. To overload trucks is merely another way of materially shortening their useful life as well as decreasing their range of activity. An overload increases the stresses in the weight carrying members and causes excessive breakage of parts. The depreciating point is so high that it is near the danger point. The successful operator of motor trucks rarely overloads, feeling that the slight advantage in tonnage which he might temporarily gain is more than offset by longer life of the truck, lower maintenance costs and reliability in times of need.

Were the truck overloader the sufferer only unto himself, he might be passed by with a pitying glance. But his practice hurts the industry, and his experience discourages the more intelligent buyer from using motor trucks. This sinner is the one who is largely responsible for much legislation against motor trucks; he is the one who makes the innocent suffer with the guilty for his overloading. He is the one who makes it difficult for the rubber company to properly cushion the mechanism, and to make a product that will produce satisfactory mileage.

Salesmen should be sure they sell a truck with ample capacity—be on the heavy side rather than the light. Instead of advising the client that the safety factor provided by the engineers should be utilized for additional weight carried, the buyer should be told that this margin of safety has been provided for bad road conditions, emergency instances of long operation, etc. Everybody knows there is a well-balanced margin in every well designed truck; it is equally fair to recognize this should not be unfairly called upon, but should be held in reserve.

If the salesman permits the owner to purchase from him trucks whose tonnage capacity is too small, he will seriously jeopardize his own prestige and the prestige of the company whose truck he is selling, because all with experience realize the absolute futility of attempting to overload motor trucks and the inevitable high upkeep expense which will result.

Truck users should remember that the various state highway departments are scrutinizing the weight of trucks, and are basing license fees accordingly. It is entirely possible that the state highway laws will very soon be of material assistance in stamping out overloading, which is simply a false application of carrying capacity, which would not be countenanced by the authorities.

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*Truck Sales Manager, Pierce-Arrow Motor Car Co., Buffalo, N. Y.

Good Roads Bring Increased Traffic

That with the improvement of roads comes increase in traffic is seen in the paving of the road between Toronto and Hamilton, Canada. Before this road was paved, 526 vehicles traversed the most heavily traveled section in one day. At present the average daily traffic is 3,000 vehicles. As high as 400 motor trucks laden with freight travel over this road in a single day.

Motor Traffic in New York City.

The daily average number of motor vehicles entering and leaving Manhattan, New York City, is 154,700, according to figures secured by a recent traffic survey. Of this number, 139,000 cross bridges and 14,846 cross by ferry. Trucks carried an average load of 1.14 tons and truck traffic is heaviest during the first and middle of the week. Unloaded trucks counted in the survey amounted to 23%.

Rhode Island has 8,651 motor trucks registered in 1920. Last year the number of trucks registered was 7,100.

Pennsylvania has a motor truck registration of 50,226 for 1920. Last year the registration was 10,406.

The Kansas City, Mo., Jitney Association will operate motor buses with two decks having a carrying capacity of 50 passengers.

The People's Bus Line, Wilmington, Del., has added 50 motor buses to its equipment and will run lines to new points near that city. This company charges 5 ct. for a ride while the street railways charge 8 ct.

MEETINGS

Calendar of Coming Meetings

Nov. 8-12.—League of California Municipalities.—Annual convention, Chico, Cal. Executive secretary. W. J. Locke, Pacific Bldg., San Francisco, Cal.

Nov. 15-17.—City Managers' Association.—Annual convention, Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York, N. Y.

Dec. 13-16,—American Association of State Highway Officials,—Sixth annual convention, Washington, D. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

Jan. 25-27.—Associated General Contractors of America.—Annual convention, New Orleans, La. Secretary, G. M. Buchholz, 111 W. Washington St., Chicago, Ill.

American Road Builders' Association

Representatives of 15 industries identified with highway construction held a meeting at the Automobile Club of America, New York City, on Oct. 22. The purpose of the meeting was to complete the organization of an advisory committee of manufacturers to cooperate with the American Road Builders' Association in holding a great exposition of road building equipment and materials in connection with the association's annual convention, which will be held at the Coliseum, Chicago, Ill., during the week of Feb. 7, 1921.

The industries represented at the forthcoming exposition will include the sand and gravel industry; crushed stone; Portland cement; asphalt and oil; tar; granite block; paving brick; slag; road building machinery; quarrying machinery; excavating machinery; trucks, tractors and trailers; concrete mixers; engineering instruments, and explosives. It was developed at the meeting that upwards of $1,000,000,000 is annually available for highway and street work and that a genuine necessity exists for capacity production and distribution of highway materials and equipment.

An executive committee to represent the producers and manufacturers was appointed, consisting of J. E. Pennybacker of the Asphalt Association; B. H. Wait of the Portland Cement Association; W. T. Chollar of the Lakewood Engineering Co.; D. C. Fenner of the International Motor Truck Co.; and P. P. Sharples of the Barrett Company. A Chicago committee was also appointed, with S. F. Beatty of the Austin-Western Road Machinery Co. as chairman.

Motor Truck Association of America

The first of a series of monthly winter meetings of the Motor Truck Association of America was held at the Automobile Club of America, New York City, on Oct. 27, with an attendance of over 100 members. Following the dinner, the members were addressed by Police Commissioner Richard E. Enright of New York City, who spoke upon traffic conditions in the metropolis.

Among the suggestions for relieving the traffic congestion outlined by Commissioner Enright, was the removal of the elevated lines on 6th and 2d Aves., converting them into subways. This would give the city two thoroughfares for through traffic and the cost of the improvement would in a short time be paid by the increased taxes which would result from the enhanced property values on these avenues. He also announced that the system of traffic control inaugurated this year on Fifth Avenue, and reently described in GOOD ROADS, would be extended to other parts of the city.

It was also pointed out by the commissioner that regulation of the hours of business of commercial enterprises would materially afford relief to traffic congestion. At the docks of the city vehicles arrive at about the same time each day and wait for fours for their turn to load or unload. If this traffic were distributed so that a certain amount of traffic traveled at definite periods, conditions would be greatly improved.

A vigorous safety campaign will be conducted by the Police Department, continued Commissioner Enright, starting about the middle of November. All motor vehicles will be inspected to ascertain that the vehicle is in proper condition and that the driver is qualified to operate the machine. Tags will be placed on the cars to show that they have been inspected. The owners and drivers of the automobiles will be given copies of the traffic regulations at the time of inspection.

Concluding his remarks, Commissioner Enright stated that the City of New York paid about 75% of the taxes of the state; consequently the state ought to be willing to aid the city in securing thoroughfares, elevated if necessary, to take care of the growing traffic.

Oklahoma Highway Engineers' Association.

At a recent meeting of the Oklahoma Highway Engineers' Association held in Oklahoma City, the following officers were elected for the ensuing year: President, W. M. Clarke; First Vice President, Pearl Little; Second Vice President, F. F. McAlester; Secretary-Treasurer, Frank Herman.

Highway Employees of New Jersey

Plans for a two-day convention of New Jersey State Highway Department employees are being made by the State Highway Commission. The meeting will be held during the coming winter and it is planned to have an exhibition of road materials at the laboratory of the department in Trenton, where the meeting will be held. No definite date has yet been set.

PUBLICATIONS

STATE OF NEW YORK. Report of the State Commissioner of Highways, 1918. Cloth, 6x9 in., 580 pages.

Included in this volume are the reports of the state commissioner of highways, the deputy commissioners of highways, the bureau of audit and finance and a summary of the proposals received in the year 1918 for the improvement and repair of highways and bridges. Several appendices are also included containing tables of statistics of finances, contracts let, etc. The personnel of the commission for 1918 and a list of county superintendents of highways are also contained in the volume.

CONDENSED CHEMICAL DICTIONARY. Second Printing. Corrected. Cloth, 6x9 in., 533 pages. The Chemical Catalog Company, Inc., New York, N. Y.

This book gives in compact and usable form information which is frequently sought not only by chemical and testing engineers engaged in highway work, but also by general readers of engineering literature. Engineering and chemistry progress hand in hand, and the engineer often finds chemical terms that are unfamiliar. The scientific and trade names, sources, formulae, uses, containers and shipping regulations of thousands of chemicals and allied substances are given, carefully cross-indexed. Tables of weights, densities and temperature conversions are also included.

PERSONAL MENTION

E. P. Asbury has been appointed county engineer of Collin County, Texas.

James Young has resigned as a member of the New Jersey State Highway Commission.

K. Takata, connected with the Public Works Department of Japan, is in this country studying our methods of road building.

W. O. Washington, formerly County Engineer of Caldwell County, Texas, has been appointed highway engineer of Cameron County, Texas.

John C. Hildebrandt has been appointed comptroller of the Pennsylvania State Highway Department. Mr. Hildebrandt has been connected for 12 years with the Philadelphia Trust Co.

Stanley M. Hands, formerly City Engineer of Iowa City, Ia., has organized and is president of the River Products Co., a corporation which will produce and market building and paving materials.

OBITUARY

Edwin Thacher, inventor of the Thacher slide rule, the Thacher truss, the first deformed reinforcing bar, and a system of arch reinforcement, died in New York City on Sept. 21, at the age of 81 years. Mr. Thacher was formerly chief engineer of the Keystone Bridge Co., and was one of the pioneers of reinforced concrete in this country.

George W. Cooley, for eleven years State Engineer and Secretary of the Minnesota State Highway Commission, retiring from active service in 1917, died in Minneapolis, Minn., on Sept. 25. Mr. Cooley, prior to his appointment on the State Highway Commission, was county surveyor of Hennepin County, In 1909 he visited Norway, Sweden, Denmark, Germany, France, England, Switzerland and Italy to study roads and road work, and upon his return he established the European system of road maintenance on the Minnesota roads.

GOOD ROADS

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AMERICAN HIGHWAY ENGINEERS' HANDBOOK
By Arthur H. Blanchard
Flexible Leather, 4¼x7 inches, illustrated $6.00 postpaid
E. L. POWERS COMPANY
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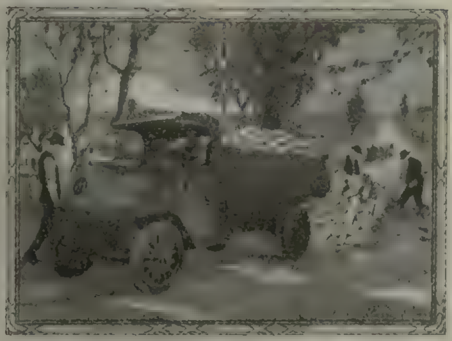

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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Present Status of Macadam Base for Bituminous Pavements*

By JULIUS ADLER†

There has recently been a marked revival of discussion on the value of macadam and bituminous concrete as foundations for use under asphalt pavements of various types. While the two kinds of base mentioned have some points of similarity, there are essential points of difference, and what follows has reference only to macadam and closely related types. An analysis of these discussions shows the following advantages claimed for this type of construction:

1. Economy in utilizing existing macadam pavements.

2. Lower cost (depending upon available materials, labor, rates, etc.) of construction of new macadam base as compared to Portland cement concrete.

3. Freedom from the transverse cracks which develop in bituminous surfaces on Portland cement concrete, due to the contraction and cracking of that type of base.

4. Slight "resiliency" of the macadam base, which reduces the hammering or anvil effect produced upon an asphalt surface laid on an unyielding base.

A considerable number of the statements above referred to have issued from disinterested sources and the following quotation from an article by a city engineer of a southern town is fairly typical of the viewpoint of those advocating the use of macadam and similar foundations, either old or newly constructed:

MACADAM PREPARED TO SERVE AS A FOUNDATION COURSE

BINDER COURSE ON MACADAM BASE SHOWN IN THE BACKGROUND

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*Paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Technical Engineer, Atlantic Refining Co.

"From long experience and observation of the behavior of bituminous pavements laid both over a concrete base and over a well constructed macadam base, this department has concluded to abandon the use of the concrete base for bitulithic and other types of bituminous pavements. The reason for this conclusion is that bitulithic actually stays put on a macadam base very much better than on concrete. * * * * * A properly prepared macadam foundation is quite elastic. It absorbs a considerable portion of the shock of heavy auto trucks and does not throw the entire burden of impact upon the wearing surface. * * * * Use is made of the old macadam roadway surface to the fullest practical extent. The grades and crowns for the new pavement are adjusted so as to disturb the old macadam roadway bed as little as possble."

Numerous quotations similar to this could be drawn from both printed and verbal discussions by engineers to illustrate the same point, and examples too numerous to mention are cited of the successful use of bituminous pavements on this type of base from southern Canada to Florida.

In contrast to this viewpoint is the growing tendency in some localities to disregard the possible value of the macadam road for use as a base, the explanation usually being that it is inadequate under all-year-round heavy motor truck traffic. In such localities the macadam base is perhaps, without exaggeration, regarded as a sort of necessary evil, the best examples to be maintained by bituminous surface treatments until conditions permit of removal and complete replacement by a new type of construction, while those less acceptable are replaced as speedily as conditions permit. In support of this position are the reports from a number of localities of serious damage to both macadam roads proper and macadam base types during the winter of 1919-20.

Between these two opposite and extreme viewpoints there must undoubtedly be a proper course of action dependent upon a number of conditions and taking into consideration both immediate and ultimate economy in expenditures. Obviously, with the great extent of territory in which macadam roads may be found, with the wide variation in climatic conditions, and in volume and weight of traffic (both of the latter frequently occurring within a comparatively limited area), broad statements in regard either to the merit or lack of merit of a given type of pavement should be made with caution, since they may too often be based upon strictly local examples of construction whose success or failure may have been attributable to strictly local conditions.

The solution of the problem of determning the limitations of a given type of paving construction lies in first establishing the factors affecting its strength and durability, and second the application of these factors to a specific case of proposed construction — the latter, it must be admitted, being very often a difficult matter.

In the present case these factors are as follows: I. Strength of the base; II. Variation in supporting power of the earth subgrade; III. Volume and weight of traffic.

I. Strength of the Base

Under this heading are included such elements as (a) total depth and degree of consolidation of the base, (b) the size of the units used as aggregate, and (c) the strength and durability of the aggregate.

In the matter of depth of base, it is of course generally recognized that, other things being equal, the greater the depth the greater the area to which a given load is transmitted.

Degree of consolidation, as an item under strength of base, refers to the thoroughness with which the pieces of aggregate have been pounded into place during the process of construction and especially by the action of traffic. In this connection it is generally conceded that macadam which has actually carried traffic, if only for a comparatively short period of time, is more reliable from the standpoint of consolidation than that which has been compressed only by means of a roller.

Under size of units of aggregate, there must be considered the relative value of a base consisting of small pieces of stone, say 1½ in. in diamater and less, of one consisting chiefly of coarse or ballast-size stone, and finally of a base in which large pieces are employed such as the Telford type, or the stone "sub-base" frequently used in New England, New York and elsewhere.

Results in general point very clearly to the greater value of the base employing the largest possible size of aggregate, affording as it does greater stability and better distribution of loads, freer drainage and less disturbance by frost action.

Under strength and durability of the aggregate is considered the quality of the material composing the aggregate itself. Extremely soft, shaley or rotten stone and very porous grades of sandstone and similar materials will, in course of time, disintegrate under combined traffic and frost action. In general. however, it is pretty well established that no such degree of hardness and toughness is required for the base material as for the aggregate composing the wearing surface.

II. Variation in Supporting Power of the Earth Subgrade

Observation of failures of macadam foundations shows that in the last analysis this factor is usually the one causing the most serious damage. The supporting power of the subgrade is evidently affected primarily by the character of the soil, by the natural and artificial provisions for drainage and by climatic conditions, including the amount of rain and snowfall, depth of frost action and likelihood of alternate freezing and thawing.

In past years when the well built macadam road might have been called the most approved type for all but city use, examples of its surprising beam strength, with subgrade support removed, were frequently discovered. For present day traffic conditions, however, wherever motor trucks are using the roads, the beam strength of the usual macadam base must be considered as nearly negligible; in other words, there must be reasonable assurance of nearly uniform subgrade support for any except possibly foundations made up of a considerable depth of large or Telford size stone.

The character of the soil is clearly all-important in this connection. Free draining, sandy and gravelly soils form, as is generally understood, vastly better subgrade than retentive clay soil, and in certain localities there are astonishing examples of extremely light macadam bases laid on free-draining subgrade of the sort referred to, and carrying considerable traffic with entire success. Where the location of the road and character of the soil are such that natural drainage is poor, all forms of artificial drainage should be provided. Every discussion on proper road construction has from time immemorial included a statement in regard to the prime necessity of good drainage, while at the same time conceding that it is a sadly neglected feature. Whatever may have been the necessity for proper drainage under the traffic of the past, it was never half so essential as it is under the heavy loads of today. That considerable improvement in the uniformity of supporting power of the subgrade can be effected by thorough provision for artificial drainage is definitely established, and in many cases a macadam base now giving unsatisfactory service can be made entirely satisfactory. This will undoubtedly leave a small percentage of extreme cases where poorly drained heavy clay soil conditions in flat sections subject to severe frost action will represent a combination of circumstances under which the average macadam base will have insufficient strength under heavy traffic units, even though the prevailing methods of subdrainage are provided. Such conditions, however, are likely to prove a severe test of strength of any type of base of ordinary strength or thickness.

Alternate freezing and thawing, resulting in the condition of soft, thawed out layers overlying hard frozen ones, together with the usual heaving effects, etc., produce a very serious lack of uniformity of supporting power unless the subgrade can be kept nearly dry throughout the winter.

In contrast to this condition there may be cited numerous examples of roads preserved in localities where, after winter has once set in, the temperature remains uniformly low enough to keep the earth in a frozen condition, thus preserving its supporting strength and eliminating the possibility of the percolation of water into the soil during this period. When this condition prevails, the critical time for the base is limited to the period during the spring, when the frost leaves the ground, and the danger of breaking up is consequently much reduced as compared with the road which is subjected to the possibility of several alternate freezing and thawing periods during a single winter.

III. Volume and Weight of Traffic.

Traffic records over the past five to ten years, especially in thickly populated sections and near large cities, show enormous increases in the volume of traffic unit, resulting in the use of many of our old this increase in volume of traffic has been the much more serious matter of increase in weight of the traffic unit, resulting in the use of many of our old roads by concentrated loads several times greater than the heaviest experienced in former years.

From the standpoint of the integrity of the macadam base, probably the most important point is that of the likelihood of the use of the road by the loads in question throughout the year. In rather cold, mountainous or thinly populated sections where the traffic practically disappears through the winter, and does not reappear in quantity until well on into spring at a period when the subgrade is pretty well dried out, the damage by this type of traffic to the macadam foundation may be relatively slight, while in general the most severe damage is found in localities where the heavy motor truck uses the roads throughout the year, and more especially during the months of February, March and April.

Suggestions for Improvement

Assuming the foregoing outline to be a correct analysis of the elements which affect the supporting value of the macadam and similar types of foundation, the problem remains of applying these factors to an individual case, and attempting to determine in advance which ones would be apt to limit the life of the foundation and the overlying pavement.

Since each of these elements will vary with every individual case, only general suggestions and recommendations can be made to aid in their application.

In the matter of strength, it will be found that recent recommendations as to the minimum permissible depth of a base of this type vary from as low as 4 in. to as high as 12 in., depending somewhat on individual opinion as well as upon the soil and drainage conditions, etc., affecting the given piece of work. In general there has been a decided tendency to over-estimate the depth of existing bases, arising largely from the belief that the annual practice of "dumping stone" on the road over a period of years has resulted in building up a very considerable depth, and failing to take into consideration the fact that usually an equal amount was removed by traffic. This, of course, suggests that, in the use of old roads, a careful survey of the depth of the road should be made by means of test holes, giving an idea not only of the depth, but also of the character of the existing aggregate. Examinations of this sort will show many old roads containing an average depth of 6 to 8 in. (in some localities much more) of compacted stone—these being the ones that are well worth saving. In general, no radical view should be adopted as to the least thickness of the base which will support the proposed pavement since there are few localities in the northeastern half of the country, and especially near large cities, where a total depth of base of 4 to 6 in. (as sometimes recommended) will be sufficient. The writer believes, however, that even where an ample depth of stone is found, it is usually desirable on old roads to add a uniform layer of ballast-size aggregate which will serve to elevate the proposed bituminous pavement above the level of the old base, which, due to the large amount of dust and fine material usually contained, is very apt to hold a considerable amount of moisture in its capillary voids at certain periods in the year. The objection usually offered to this is the danger of disturbance of the old consolidated road; and while in a general way this principle is undoubtedly correct, on the other hand the old road which will not stand disturbance for the depth of 2 or 3 in. required for scarifying, before the addition of a new layer, will generally not be adequate in depth for use as a foundation in any case. Furthermore, the greater regularity of contour of the base to which a complete new layer of aggregate has been added, will be found to more than offset in the life of the bituminous pavement the original advantage of paving over a slightly better consolidated, but irregular base, which is apt to produce a pavement of irregular contour. Finally, consolidation can usually be completed by admitting traffic, under restriction, over the completed base.

In the matter of supporting power of subgrade, a very considerabble improvement over the existing condition could be looked for from the adoption of the principle that in the utilization of existing macadam as a base for bituminous pavement, at least as much provision should be made for drainage as though an entirely new piece of road were to be built over the same character of subgrade. This, however, is not generally done. Too frequently shallow ditches, ditches too close to the improved surface, sections requiring special drainage, etc., are apt to be allowed to remain without improvement. Recent reports from England are to the effect that macadam foundations under bituminous pavements are giving entirely satisfactory service, due to systematic attention to and improvement in drainage conditions.

One type of failure of the macadam base has been the squeezing out and breaking up of the sides, due to a combination of too little lateral support at the shoulders, the softening of the subgrade under the edges of the pavement due to the entrance of water, and in general, failure to recognize that the sides of the road are frequently thinner and weaker than the central portion. As one means of overcoming this condition, it is believed that the thoroughly consolidated base of full depth should always extend at least 1½ to 2 ft. beyond the edge of the pavement laid upon it. If the improved surface is of reasonable and adequate width to accommodate traffic, it will then be found that the thrust on the foundation from heavy, slow moving loads traveling on the sides of the road will meet with much greater resistance than is now encountered. If, however, the improved road is so narrow that heavy traffic is constantly cutting off and on, damage will naturally continue to result.

As a further step toward improvement, some means of water-proofing the shoulders, at the same time furnishing support at the edges of the bituminous pavement, should be provided. Cases have been noted where the existence of an old macadam shoulder, even though rather thin, has been of material benefit. Well built stone block or rubble gutters and headers produce a similar result. If no better provision is to be made, all stone removed from the old surface should be used to harden the shoulders and additional aggregate brought in where required.

One of the best practices in this connection on country roads consists of the construction of bituminous macadam wings 3 ft. or more in width providing water-proofing and lateral support to the pavement, and at the same time furnishing a hardened surface capable of carrying occasional loads. At the least, however, there should be along each edge of the pavement a strip of hardened surface having the same width as the 1½ to 2 ft. extensions of the base previously referred to.

This recommendation may be criticised on the basis that it calls for the construction of a road of a greater width—with a consequent reduction in economy—than would be required if some other type of construction were used, but in its support it may be said that the change from an improved width of perhaps 15 ft. for two lines of traffic, only a few years ago, to the present situation where 20 ft. is frequently mentioned as being desirable, points unmistakably to the necessity for providing ample width at the outset on roads near large centers of population. It may further be added that there is reason for believing that many roads of other types built to widths of 16 and 18 ft. will eventually need protecting wings, not only for the accommodation of additional traffic, but the preservation of the pavement as well, inasmuch as a sudden drop-off from a hard surface to a soft earth or clay shoulder is objectionable from several standpoints.

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The Elimination of Unnecessary Tests from Asphalt Cement Specifications*

By R. R. Barrett†

The highway engineer's reputation largely depends upon his ability to design and construct good roads and pavements economically. The problem is to obtain the most durable type of pavement suitable to the traffic condition at the least first cost and with a minimum of maintenance expense. In his desire to obtain the best possible return from an investment by a community for good roads or streets, the highway engineer sometimes is inclined to develop rigid specifications for both materials and construction. In some instances, clauses devised by other prominent engineers or material companies are suggested as a certain control over some factor in the work or over some of the materials. Such clauses, with others, may be included in the specifications and other personally developed tests for controlling materials may be added to complete a specification that is designed to be as near fool-proof as possible.

Probably the greatest variation in controlling tests for materials occurs in asphalt cement specifications. A recent study of several asphalt construction specifications from eastern states, counties, cities and smaller units of government shows that in 30 specifications for asphalt cement or sheet asphalt construction there is a total of 22 different tests for materials occurs in asphalt cement specifiis a total of 24 different tests, and in 13 asphalt macadam specifications there are 22 different tests.

These are tests different in character. Where the numerical limit for the same test differs it is not included as a different test, as the traffic or other conditions may be such as to necessitate a change in the limits. In the total number of specifications for the three types of asphalt construction, there are 33 tests wholly different in character and object. Certainly the same tests, with proper changes in numerical limits should control the quality of the asphalt cement for either of the three types of construction. If specifications for asphalt filler for granite or vitrified block pavement had been included in the above, the number of different tests would have been augmented considerably.

A number of these tests are no more nor less than identification tests—others are of no value whatever and still others apparently weaken the specification instead of strengthening it. Occasionally a requirement is found in the specification that cannot possibly be met if the other requirements are complied with. It is an impracticable task for an asphalt manufacturer to produce enough different grades of asphalt to meet all of the tests or even alter their regular grades to conform to them. When this is attempted it usually results in a material inferior to the regular product. The result is an asphalt that complies with the specification, but one that may not run as uniform as the regular grade and one that in many cases has had a good characteristic impaired to produce the condition called for in the unusual specification.

It is true that the various asphalts on the market vary somewhat, due to the source of the crude material or the method of refining, or both; but the recognized better grades of asphalts will all meet the proper tests which really control the quality of the asphalt cement. Thus, with a short concise specification, fair competition can be obtained from the reliable manufacturers of asphalt and in case their product in any particular shipment is cracked or too soft or is wrong in some other important respect, it can be determined by the essential controlling tests. This is accomplished not by identification or irrelevant tests but by the few simple controlling tests included in the modern truly competitive specifications. By increasing the limits of a test or tests in the specification a desirable material not previously admitted can be included without impairing the value of the other products already admitted.

The American Society for Municipal Improvements, the U. S. Bureau of Public Roads, the American Society of Civil Engineers and others have been working for some time toward the standardization of asphalt specifications. In the specifications finally adopted by the first two mentioned, there are no superfluous tests. The American Society of Civil Engineers has largely confined its efforts, up to the present time, in standardizing the methods of conducting the various tests.

There are three basic characteristics a good asphalt cement for paving purposes must possess: (1) It must be of proper consistency; (2) it must be cementitious; (3) it must have stability or permanency of character.

In addition to the three basic characteristics, other important requirements are purity, homogeneity, resiliency and uniformity. The properties required of a good asphalt paving cement can be controlled completely by a few of what might be termed essential tests, a list of which with brief descriptions of their purposes follows:

Solubility in Carbon Bisulphide: To determine the per cent. of purity of the asphalt or its total bitumen content.

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*Paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Engineer, Asphalt Sales Dept., The Texas Company.

Flash Point: This is principally a precautionary test to prevent shipment of asphalt that might flash at a temperature usually used in heating the asphalt. A low flash indicates either a cut-back asphalt or one made from a crude from which all the light oils have not been expelled.

Melting Point: This test has been included in many specifications to insure obtaining an asphalt that can be easily handled at a reasonable temperature from storage tanks and in heating kettles. It is a fact, however, that in many instances the melting point test does not accomplish this. The melting point gives little information in regard to the fluidity of asphalt at working temperature and a much bebtter test to determine the fluidity or workability of the heated asphalt is the viscosity at 250° or 300° F. This test is also used to prevent shipment of blown material of low ductility when a ductility test is not included as in the U. S. Bureau of Public Roads specifications.

Penetration: To determine the hardness or consistency of the asphalt. By changing the limits of the penetration test at 77° F., a proper consistency for different classes of traffic is obtained. The penetration is taken at 32° F. and 115° F. to determine the susceptibility of the asphalt to temperature changes. It is very important to have an asphalt that does not vary excessively in penetration between 32° F. and 115° F., as this will insure physical stability in the finished pavement.

Loss on Evaporation: An accelerated exposure test.

Penetration after Evaporation: The penetration test at 77° F., 32° F. and 115° F., after prolonged heating at high temperature, gives an indication of changes that may take place with age at ordinary temperatures. This test also determines the character of the material after it is subjected to heat similar to that necessary in heating the asphalt and the mixture at the plant.

Specific Gravity: Not altogether necessary but used as a gauge of uniformity and in determining weight of bulk shipments.

Ductility: To insure cohesion in the asphalt cement, stickiness and non-brittleness. Too high ductility generally indicates a reduction in the resiliency of the asphalt. On the other hand, an asphalt of too low ductility lacks cementitiousness and, therefore, is not a satisfactory binder.

Homogeneity and Freedom from Water: To insure uniformity of physical composition throughout and to prevent water which would cause foaming in heating the asphalt.

Every highway engineer has a theory in regard to asphalt cement and the proper tests for control. Perhaps in the above it would be well to include the solubility in carbon tetrachloride to determine the carbenes or possible cracking in refining, but this test is not now considered a necessity. The solubility of naphtha to determine the relative proportion of petrolenes and asphaltenes is not now generally considered a desirable test, as the variation in the gravity of naphtha seriously affects the results of the test and it has been found almost impossible to standardize.

The ductility test is generally considered necessary, although it has not been included in the U. S. Bureau of Public Roads specification.

The Borough of Manhattan, New York City, found the susceptibility test, as explained above under penetration, of great value and unquestionably this has an important part in controlling the character of the asphalt cement supplied this borough.

Some or all of these last mentioned tests, however, can be and are sometimes used, by properly fixing the limits, to close specifications for a certain brand of material. Other common tests used for identification and closing specifications for certain brands of material are: Per cent. of paraffine scale; per cent. of sulphur; solubility in ethyl ether, and fixed carbon. None of the above is strictly necessary if the other proper tests are included in the specification. The per cent. of sulphur and solubility in ethyl ether are absolutely unnecessary, as in the case of the former the sulphur has no effect on the asphalt and the solubility in ethyl ether shows nothing at all—simply identifiies certain products. Often the ductility clause is made an excessive minimum, thus eliminating certain asphalts that have proven entirely satisfactory for paving purposes. A very high ductility material is apt to be sensitive to temperature changes and usually lacks resiliency—an important adjunct of a good paving asphalt. On the other hand, to a certain extent, too low ductility indicates low cementing value. A reasonable ductility and a low differential of consistency between 32° and 115° F. indicate an asphalt cement that will produce the most satisfactory pavement when properly combined with the aggregate.

The field of asphalt construction is rapidly increasing. We hear now of asphaltic concrete bases, asphaltic mastic cushion for brick and block pavements and many other new forms of asphalt construction. These new types of asphalt construction, together with the increased use of the standard types of asphalt pavements, have been responsible for the introduction of many new asphalt cement specifications and the time is ripe for a concentrated coordinate effort on the part of the various engineering societies, the Bureau of Public Roads and the engineering press in standardizing asphalt pavement specifications and securing their uniform adoption. The engineering societies and the Asphalt Association have started action in this direction and the latter society particularly is to be commended

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MACADAM FOUNDATIONS

There is doubtless a tendency toward the more general utilization of macadam foundations under bituminous macadam and bituminous concrete wearing surfaces. It is particularly marked in those cases in which the work to be done is the reconstruction of a road on which there is a macadam surface in fairly good condition.

Arguments on both sides are discussed in a paper, by Julius Adler, which is printed on other pages of this issue. It covers most of the points that are urged by both the advocates of macadam foundations and those who favor Portland cement concrete bases for all heavy traffic roads and streets.

In many instances a cement concrete foundation is required by traffic and other conditions. Probably no general rule could be laid down that would cover all cases, for, like many other road building questions, this is one in which individual roads must be given consideration as individual problems. On the other hand, there are probably quite as many cases in which the best construction and economy indicate the macadam foundation. It is certain that in the improvement of a road on which there exists a macadam surface of even fair quality, the scraping of the old macadam should be resorted to only when the need for a cement concrete base is very definitely established.

CARING FOR UNPAVED CITY STREETS

The unpaved streets of the average city—including in the classification "unpaved" water-bound macadam and a number of other surfacings sometimes referred to as pavements—are serious obstacles to traffic and a very real detriment in a great many ways.

In more than a few cities they are more troublesome than they need be.

Granting that it is impossible immediately to pave all the streets and even that a comparatively long time must elapse before some of them are reached, is it necessary to neglect them entirely or almost entirely? Some of them could be greatly improved by using a drag or planer early in the spring. Oiling them a little later would add to the improvement. Quite often they are both dragged and oiled, but the former is not undertaken until late spring or summer and the latter not until late summer or fall.

Both dragging and oiling are annual jobs. If they are to be done at all, there would seem to be no valid reason why they should not be done at the right times. The difference between doing them after traffic has traversed ruts and bumps and raised clouds of dust for half the season of heavy traffic and doing them as early as possible is merely the difference between slipshod, hand-to-mouth methods and careful, intelligent planning.

UNNECESSARY TESTS FOR BITUMENS

Under the caption, "Too Great Refinements in Road Building Specifications," reference was made in this column a few weeks ago to the tendency to set too narrow limits for certain tests. The comments made therein were primarily upon papers by Herbert Spencer and Wallace T. Purrington, abstracts of which were printed in the same issue. Reference was also made to a paper by R. R. Barrett, of the Texas Co. That paper is printed on other pages of this issue.

In the paper by Mr. Spencer, printed in the issue of Oct. 20, special attention is directed to the practice of fixing too narrow limits of penetration. In this issue, Mr. Barrett argues for the simplification of asphaltic cement specifications through a reduction in the number of tests stipulated. Some of the tests not uncommonly specifiied, he claims, are superfluous and sufficiently definite specifications could be drawn by including only the really essential tests.

It should be evident that the best specification is that one that describes what is wanted and does it in the shortest and simplest manner. Producers seem to be very generally agreed that there is too great refinement in bitumen specifications and the suggestions made by Mr. Barrett, who so lucidly sets forth the producers' side of the question, certainly merit careful consideration by engineers.

Present Status of Macadam Base for Bituminous Pavements

(Concluded from Page 228)

In a number of instances, the depth of the ditch and its distance from the edge of the improved surface appear to play an important part in the strength of the macadam foundation. If too close to the edge of the pavement, open ditches allow moisture to get under the base and reduce the support; if far away, leaving a wide unwater-proofed shoulder, there is too much opportunity for the entrance of water through the surface, especially at times when the ground is heavily blanketed with snow or ice. The absence of these pervious shoulders is noticeably beneficial in city and suburban streets paved from curb to curb. It is, therefore, believed that for country roads a shoulder about 5 to 6 ft. wide, with provisions for waterproofing between the edge of the road and a point near the edge of the ditch, represents the most desirable arrangement.

To summarize the foregoing discussion, it is believed that proper preliminary studies will make it possible to determine those cases where a macadam base for a bituminous pavement would, at best, be positively inadequate, and the steps which will be necessary in all other cases to place them in proper condition for use; that (in contrast to the old desire to make use of the macadam with as little expenditure as possible) greater attention to and provisions for proper drainage and thickness, admitting the present limitations to the knowledge of the matter of drainage, will still, in a large proportion of cases, establish the desirability and economy of utilizing existing macadam as a foundation for bituminous pavements.

The Elimination of Unnecessary Tests from Asphalt Cement Specifications

(Concluded from Page 229)

on the work already accomplished along this line. What we need now is coordination and cooperation by the other societies, the Government and the engineering press in completing the standardization and giving the movement the necessary publicity.

It is quite obvious that the work of the U. S. Bureau of Public Roads and the societies that are working toward standard specifications is of the greatest importance, not only to highway engineers but to the asphalt industry.

The specifications of the American Society for Municipal Improvements covering asphalt pavement construction are concise and contain only essential test which would insure a high grade asphalt cement; are not closed to any good asphalts, and have no superfluous clauses. They certainly could be used as the fundamental from which general standard asphalt pavement specifications could be developed and accepted by the other interested engineering societies and the Bureau of Public Roads.

Already the American Society for Municipal Improvements specifications have been adopted as standard by many municipalities and if the members of this society will actively and enthusiastically work for their adoption in their own locality it will not be long before these specifications will be the recognized standard of this country and will of necessity compel the cooperation of all other interested societies, public offices and the engineering profession generally.

Indiana Sues Road Contractors

The State of Indiana, on behalf of the Board of County Commissioners of Tippecanoe County, has brought suit against P. H. Slattery and Richard Burke for $75,000 damages. It is charged that the two men abandoned a contract after the road had been partly finished.

Work Progresses on Pacific Highway

Over 50% of the mileage on the Pacific Highway between Portland, Ore., and Oakland, Cal., has been paved and several paving and grading contracts are now in force on the unimproved sections. The length of this highway between Portland and Oakland is 720 mi. A great amount of tourist traffic passes over the highway to and from California. It is expected that by the end of 1921 more than 475 mi. of this highway will be paved.

Oregon Protests Against Deforestation of Land Along Highways

Governor Sends Letter to Lumber Company About Cutting Timber Along Scenic Road

Governor Olcott of Oregon has sent a letter to the Brooks-Scanlon Lumber Co., protesting against the cutting of timber along The Dalles-California Highway. Governor Olcott said in part:

"It is the plan to secure some legislation which will do justice to everyone concerned as nearly as possible, but at the same time preserve the forest strips for all time to come.

"The Dalles-California Highway, when completed, promises to be one of the most magnificent pieces of roadway in the entire Pacific Northwest. All of us, as citizens of the state, owe a patriotic and civic duty in endeavoring as far as possible to preserve our wonderful natural surroundings. We have no desire to deprive private holders of the right which they have in their timber, but we do feel that a cooperation between the state and the timber companies may be secured which will be of immense advantage to the state and consequently in the long run, to the timber companies themselves."

Citizens Give Funds To Build Road

Property holders of Virginia Beach, Va., at a meeting held Oct. 8, subscribed $5,000 as the beginning of a fund to improve Atlantic Ave. It is planned to pave the road with concrete, 18 ft. wide.

Will Work on Oregon Road During Winter

Work on the Alsea River Road, Oregon, extending from Waldport to the boundary of the Suislaw National Forest, will continue through the winter, according to R. S. Shelley, Supervisor of the Suislaw Forest. Work on all other roads in the forest will be suspended during the winter.

Springfield, Mo., To Widen Two Streets

McDaniel Ave., and Olive St., Springfield, Mo., will be widened to 40 ft. and 60 ft., respectively. Property along the south side of McDaniel Ave., from South to Campbell Sts., will be condemned for the improvement. One block of Olive St., between Main and Campbell Sts., now 40 ft. wide, will be made 60 ft. wide, making the street uniform in width with that east of Campbell St.

Oregon County Road Bonds In Dispute

Supreme Court Decision Holds Bond Issue of Clackamas County Invalid and It Will Affect Bond Issues of Five More Counties

The Oregon Supreme Court recently handed down a decision declaring that a $1,700,000 road bond issue of Clackamas County was invalid because it makes the county's bonded indebtedness in excess of 2% of its assessed valuation and that the constitutional amendment making the bonded indebtedness limit 4% had not become effective when the highway bonds were issued. The road bond issues of five other counties of the state will be affected by this decision, as follows: Crook County, $220,000; Union County, $1,498,000; Lane County, $400,000; Yamhill County, $420,000; Jackson County, $500,000. The state has done considerable work on the highways of these counties, and about $1,000,000 is due to the state.

The State Highway Commission has filed a petition asking that the commission be made a party to the proceedings and intervene in the litigation on behalf of the state. "The situation," says the petition, "as now presented is of great moment to the state in that if the law as construed in the Clackamas County case must stand as a law, road construction will be greatly retarded and if any of the said counties should fail to repass its bond issue, such counties will be without funds to reimburse the state, and by reason thereof the state will sustain great financial loss and damage."

Maryland Seeks to Tax Operators of Mail Trucks

Several years ago a driver of a U. S. mail motor truck in Maryland was arrested and fined $10 for not securing a license as required by law. The case was appealed to the Circuit Court of Frederick County and is now before the U. S. Supreme Court. The Post Office Department claims exemption from the operation of the Maryland law in its application to all vehicles carrying U. S. mail.

Bankers Favor More Federal Aid

A five-year federal hghway construction program involving the expenditure of $500,000,000 additional federal funds, was urged in a resolution adopted by the Agricultural Commission of the American Bankers' Association at the recent convention of the association at Washington, D. C. The resolution was introduced by William G. Edens, of Chicago, Ill., and favors retention of the present system of cooperation between the Federal Government and the states as the "best available" plan.

President-Elect Harding on Good Roads

Advocates Construction of Motor Truck Roads to Facilitate Food Distribution

"One of the greatest economic problems, if not the greatest problem of modern civilization, is distribution," Senator Harding said in a campaign speech. "There can be no doubt of the position of the good roads movement in the solution of the problem.

"I believe that federal and state governments must not only put their shoulders to the wheel to create good roads, but they must insist on the maintenance of roads in good condition. A good road gone wrong is almost worse than no road, because it is a streak of memorial to neglect and waste.

"The roads we build in America must be built, first, for use in the distribution of products rather than for merely passenger riding. We must foster the use of motor trucks. We must build urban terminals for truck service to make new ties between communities and between city consumption and country production."

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South Carolina has completed surveys for 922 mi. of highways, according to State Highway Engineer Moorefield.

Road District No. 1, Tangipahoa Parish, La., will issue $325,000 of bonds for highway construction and maintenance work.

South Dakota celebrated the week of Oct. 25 as "Good Roads Week," commercial and civic organizations collecting funds to be used in a good roads campaign.

MEETINGS

Calendar of Coming Meetings

Nov. 8-12.—League of California Municipalities.—Annual convention, Chico, Cal. Executive secretary. W. J. Locke, Pacific Bldg., San Francisco, Cal.

Nov. 15-17.—City Managers' Association.—Annual convention, Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York, N. Y.

Dec. 13-16,—American Association of State Highway Officials,—Sixth annual convention, Washington, D. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

Jan. 25-27.—Associated General Contractors of America.—Annual convention, New Orleans, La. Secretary, G. M. Buchholz, 111 W. Washington St., Chicago, Ill.

American Road Builders' Association

The annual meeting of the American Road Builders' Association will be held at the Automobile Club of America, New York, N. Y., on Nov. 15, 1920. The program is as follows:

2:00 p. m. Meeting of Board of Directors.

3:00 p. m. General meeting of Association, with reports of officers and committees.

4:00 p. m. Polls close for election of officers.

6:30 p. m. Annual dinner.

8:30 p. m. Report of tellers, followed by addresses by the retiring and new presidents and invited guests.

PERSONAL MENTION

A. C. Arend has been appointed city engineer of Omaha, Neb.

H. P. Smith has been appointed engineer of Sonoma County, California.

A. M. Green was recently appointed engineer of Modoc County, California.

J. B. Crockett has resigned as county engineer of Collin County, Texas, to engage in the contracting business.

A. S. Manning has been appointed district engineer for the fourth district of the South Dakota State Highway Department.

H. S. Sternberg has been appointed district engineer for the first district of the South Dakota State Highway Department.

J. H. Scott has been appointed division engineer by the Oregon State Highway Department.

Clarence K. Whiting has resigned as county engineer of Kent County, Michigan, and is now in the contracting business.

F. S. Peck, State Highway Engineer of South Dakota, has resigned, and is now district engineer in the Black Hills Section.

Fred H. Schreiber, formerly Assistant State Highway Engineer of South Dakota, has succeeded F. S. Peck as state highway engineer.

J. M. Barde has been appointed supervisor of the construction of the Carthage-Carterville concrete road in the Carthage, Mo., Special Road District.

O. N. Hetel has been appointed district engineer ffor the third district of the South Dakota State Highway Department, with headquarters at Pierre.

Earl Eby has been appointed district engineer for the second district of the South Dakota State Highway Department, with headquarters at Brookings.

PUBLICATIONS

MODERN ROADS by H. Percy Boulnois. Cloth, 6x9 in., 302 pages. Illustrated. Longmans, Green & Co.

The author of this book is a prominent engineer in England who sets forth in this volume the methods of highway construction and maintenance as practiced in that country. Among the contents are found chapters on traffic, water-bound macadam, bituminous roads, concrete roads, waves and corrugations. Naturally this book will prove of value to engineers desiring information on English methods of highway construction.

THE MOTOR TRUCK AS AN AID TO BUSINESS PROFITS. By S. V. Norton. Cloth, 7x10 in., 509 pages. Illustrated. A. W. Shaw Co., New York, N. Y.

This book is a very complete and comprehensive treatise on the efficient use of motor trucks in commerce and industry and will be of value not only to the owner of a fleet of trucks, but also to the owner of a single truck, for the principles of systematic operation hold whether a single or a dozen units are used. The subject matter of the book is divided into five general sections: Fitting the Motor Truck into Your Business; Making the Motor Truck Do More and Better Work; Maintenance that Lowers the Cost of Upkeep; Building New Business with Your Motor Truck; and Present Tasks and Future Problems. The book is carefully indexed, thus making all parts of the subject matter readily accessible. The important points considered in the book are copiously illustrated with 335 illustrations.

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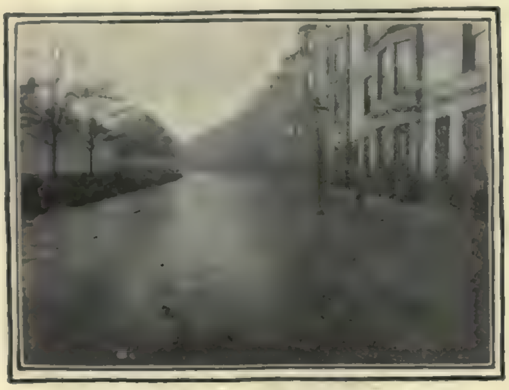

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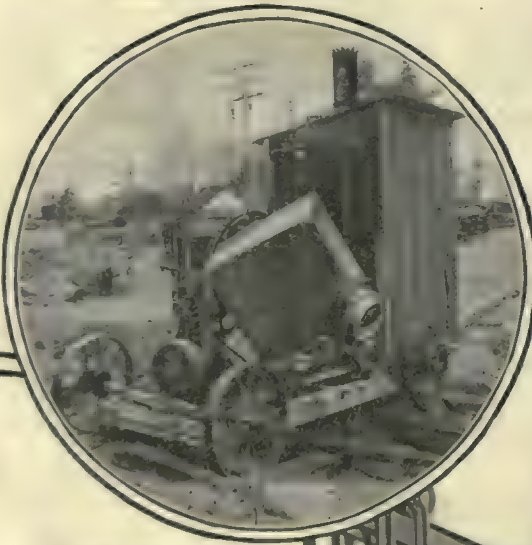
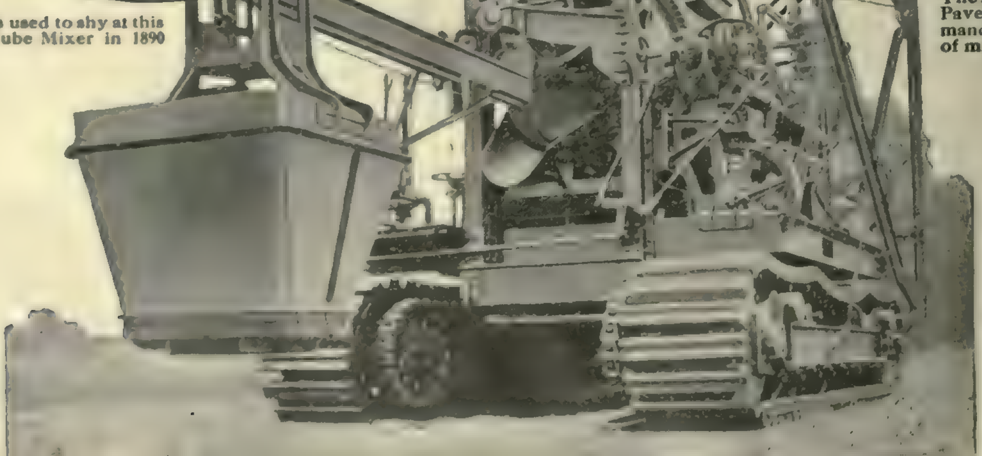


Horses used to shy at this first Cube Mixer in 1890



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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIX
New Series, Vol. XX

JAMESTOWN, N. Y., NOVEMBER 17, 1920

Number
20

Road Building in the Philippine Islands

Early Work in the Islands—Road Building Organization and Construction Methods—Labor Conditions—Transportation Methods and Costs—Present Building Activities—Traffic

Roads are the forerunners of civilization and the pioneers of progress, bringing to the land which they enter, travelers possessed of wares for exchange and new ideas which illuminate the way of progress. Not only did "all roads lead to Rome," but also did those same roads carry out to all parts of the known world the advanced civilization of the Romans. In the development of the United States we can trace the important part roads have played in the industrial, agricultural, commercial and social growth of the country.

There is a rich and fertile country, a part of the United States, which has just started to build highways to tap its natural resources, which has just entered upon a period of highway development to facilitate the exchange of commodities and ideas. This country is the Philippine Islands, a land bounteous in natural resources.

Prior to American occupation of the islands, considerable road improvement had been carried on. Most of the work was done originally on the initiative of religious orders but later control of all road work was vested in the "captain-general" and all male Filipinos were required to work 15 days each year on the highways and the barrio tenients were required to maintain the roads in the barrios so as to be passable by bull carts.

When the United States assumed control of the

ROAD BETWEEN MANILA, THE CAPITAL OF THE PHILIPPINE ISLANDS, AND THE TOWN OF LUCENA, PROVINCE OF LA LAGUNA islands, the Bureau of Public Works was organized, having control of all insular, provincial and inter-provincial roads. A definite road program has been adopted which calls for the construction and maintenance of main trunk roads between important towns. A bridge and road fund has been created and funds are spent in the province where collected. In addition, the Insular Government appropriates funds for highway work from time to time. More than 125 engineers, draftsmen, etc., are employed in the Bureau of Public Works, which has charge of all public improvements.

The standard width adopted by the Bureau of Public Works for all provincial roads is a 15-meter right of way with a metaled surface of from 3 to 5 m. The thickness of the surfacing adopted is 15 cm. However, because of the increased amount of traffic, especially that of motor vehicles, these specifications are proving inadequate and a considerable part of available road funds is required for repair and maintenance work. Since road funds are limited under the present system, some means will have to be devised to secure funds for the construction of more and better inter-municipal roads.

ROAD IN TOWN IN PHILIPPINE ISLANDS, SHOWING BISON, THE BEAST OF BURDEN

The material used in surfacing Philippine roads is for the most part gravel. Crushed stone is also frequently used. Road rollers are to be found in nearly every province and are used to compact the subgrade and surfacing materials, although in some cases the road is allowed to be compacted by traffic. In some sections deposits of limestone are found and used in road construction. Last year the Calapan-Baco Road, Mindoro, was surfaced with hand-crushed rocks and corals found along the nearby seashore. The Tinaco-Bukidon Road, Misamis, 8 km. long, is being constructed by dumping large rocks on the road and covering with crushed rock and then with gravel. Several kilometers of the Lubao-Hermosa Road, Pampanga, have been treated with asphaltic surfacing. On this work, bull cart drivers asked five pesos ($2.50) per cubic meter (1.38 cu. yd.) for hauling the surfacing material 7 km. (4.35 mi.). This price was considered excessive so the material was hauled in special carts by a road roller.

Last year the beasts of burden were afflicted by rinderpest (hoof and mouth disease) and transportation of road materials has been seriously hampered. Some provinces have purchased trucks, bancas and lighters to overcome the situation. Road work is hampered also at times by disease epidemics affecting the inhabitants of the islands. In the Province of Illocos Norte the ravages of the trancazo epidemic were barely disappearing when the frightful havoc of smallpox made itself felt among the inhabitants, terrifying the whole province and interfering greatly with road work. Considerable difficulty has been experienced at the Palsabangon Quarry, Tayabas, in keeping a sufficient number of men at work. Malaria invaded the camp and fresh laborers had to be continually recruited.

Typhoons and heavy rains play havoc with the roads and bridges. In the dry season the dust nuisance is very real and often the roads "ravel" considerably. Most of the bridges are covered with roofs of cogon, which require constant attention and repair. Some parts of the islands are in a very low stage of civilization and road work takes on the pioneer aspect. The construction of the Nantanaan-Gumiad Trail, Nueva Vizaya, is progressing very slowly because of the difficulty of securing men to work on this trail. This is due to the isolated situation of the place, which is inhabited by practically uncontrolled Ilongotes.

Materials are transported for the most part by bull carts, although motor trucks are beginning to be employed in road work. The drivers of bull carts often do their work during the nights of hot periods so as to save their animals from the sun. These bull cart drivers are often paid a specified price per cart of gravel and in La Union Province, have purchased much of their gravel from men, women and children, who "picked" and screened the material. An industrial railway, minus locomotive, is being used in the construction of the Antique-Iloilo Road, and on one or two projects elsewhere. Even baskets are used in handling materials.

As high as 600 or 700 men are employed on one job at a time. Meals are frequently a part of the compensation of the laborers, and in fact, some workers can be employed for their meals alone. This system of employment is called the "pabayani." The Municipality of Tapabas recently laid 6-in. pipe at a cost of .61 pesos (30 ct.) per length of 16 ft. by furnishing the workmen with luncheon, cigarettes and wine. (Very likely the "pabayani" with a similar menu could be employed to advantage in this country.) Wages of road laborers seldom are more than one peso (50 ct.) per day and the labor supply fluctuates with the harvesting periods. Last year workers in the rice fields were paid .75 to .90 pesos (37½ to 45 ct.) per day, with two meals, and as a consequence labor for road work was scarce in rice-growing districts, although more plentiful in others because of the poor tobacco crop.

Road and bridge construction is being carried on in every province of the Philippine Islands. In 1919 work was done on over 250 road construction projects, 150 maintenance projects and 50 bridge and culvert projects. However, funds are entirely inadequate at the present time to carry out the immense road building work necessary to develop the country. In many districts the lack of funds prevents the completion of much needed work. For example, piles were driven in 1916 for a bridge at Calero, Cavite, a structure of three 7-m. concrete spans, but work on the superstructure was not started until last year because an appropriation of 11,000 pesos, ($5,500) was lacking. Similar conditions exist throughout the islands.

An idea of the traffic on the roads of the Philippine Islands is given in the following summary of traffic over the Benquet and Naguilian Roads, from Jan. 1 to Mar. 31, 1919. The traffic on the Benguet Road during this period was 2,161 pedestrians, 2,226 bull carts, 1,138 animals, led or ridden, 19 motorcycles, 553 passenger automobiles, 481 motor trucks and 2 wagons. The traffic on the Naguilian Road during this period was 6,312 pedestrians, 4,717 bull carts, 585 animals, led or ridden, 8 calesas, 53 motorcycles, 924 passenger automobiles, 711 motor trucks and 6 wagons. During the above period the Benquet Auto Line transported 585 first class passengers, 1,009 third class passengers, 17,260 kg. of hand baggage and 301,325 kg. of express and freight.

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Highway Traffic and Transport Problems*

The regulation of traffic affects highway design, construction and maintenance in many ways. It is apparent that efficient regulation will permit the expediting of transportation on highways, which means an increase in the traffic capacity of streets. Traffic on streets is controlled through the enforcement of traffic regulations and the utilization of policemen, traffic signs and lights, traffic limit lines, bumpers or mushrooms, semaphores, crowsnests and "dummy cops." Of these accessories used for the control of traffic, attention is called to one type which is used within the traveled way, namely, the "dummy cop," which exists in several forms but whose primary function is to regulate traffic at street intersections. Generally, a "dummy cop" is movable and due to this characteristic, requires consideration on the part of municipal officials. Recently a case for damages, due to an accident caused by a collision with an overturned "dummy cop" was brought against the City of New Haven. The assistant corporation counsel states that the court held that the "dummy" was "a proper mode of regulating traffic when in place and in no sense of the word an obstruction." Damages, however, were allowed by the court to the extent of $500 because the accident had occurred due to the collision of the plaintiff's automobile with the traffic stanchion or "dummy cop" while it was lying on the traveled portion of the street after it had been knocked over prior to the accident. A canvass of practically all the municipalities represented in this society indicates that few accident cases have been brought against municipalities in connection with the collision of vehicles with "dummy cops" and that the use of this form of traffic control is widespread and is serving a useful purpose, especially in the smaller municipalities. It is apparent, however, that movable "dummy cops" should be so designed and installed that it will be difficult to overturn them, as courts will, without doubt, generally rule that while lying in traveled ways they will constitute obstructions in the highway. Without the use of "dummy cops," many street intersections will have to be increased in size or their traffic capacity will be reduced and danger of serious accidents will be materially increased.

Your committee recommends that when three or more streets meet, the intersection be so designed that it will be practicable to install rotary traffic. This system of traffic control at intersections was originated by William Phelps Eno, and is now used successfully in Paris, New York, Washington, Detroit and several other cities. If the intersection is properly designed, a vehicle enters the intersection, turns to the right and goes around within the intersection in a circular route until it reaches its desired outlet street. Those who have investigated this system of traffic control at the Place de l'Etoile in Paris and at Columbus Circle in New York fully appreciate its merits over any other system in use.

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*Extract from the 1920 report of the Committee on Traffic and Transportation, American Society for Municipal Improvements. Committee: Arthur H. Blanchard, Professor of Highway Engineering and Highway Transport, University of Michigan, Chairman; F. A. Reimer, County Engineer, Essex County, New Jersey; Robert Hoffman, Chief Engineer, Dept. of Public Service, Clelveland, O.

A detail of intersection design which must generally be observed at intersections where rotary traffic is installed and which should be universally adopted in order to expedite the passage of traffic at intersections of two streets is the proper design of curb corners. Investigations show that in many municipalities very small radius curb corners have been installed. In the days of slow moving horse-drawn vehicles, the use of short radius corners was not as objectionable as it is today. In order to provide for expeditious and safe passage of traffic at intersections, your committee recommends that generally the proper radius to use is the longest one which may be employed without reducing the width of sidewalks so that they cannot be used satisfactorily by pedestrian traffic.

There has developed, in many municipalities, the use of traffic limit lines to designate safety zones. Your committee especially has in mind lines limiting the boundaries of car-stop safety zones. These limit lines are designated by the use of painted strips on pavement surfaces, by stanchions, by raised woden or concrete platforms, or by bumpers or mushrooms. It is evident that the utilization of car-stop safety zones materially reduces the width of roadway available for vehicular traffic and, therefore, their use should be given careful consideration by municipal engineers and officials in connection with the design of street widths and in the formulation of traffic regulations. Your committee recommends that municipal traffic regulations include provisions which will prohibit vehicles from stopping at curbs to transfer passengers or commodities opposite car-stop safety zones and a reasonable distance each side thereof. Considering the general use of roadways adjacent to curbs by vehicles stopping for the transfer of passengers or commodities and for ranking and parking purposes, it is evident if the above regulation is put in force that the utilization of car-stop safety zones will not usually reduce the available width of roadway for moving traffic.

From the standpoint of the requirements of highway transport, your committee condemns the uneconomic practice of constructing excessively wide paved roadways in small municipalities. Definite recommendations regarding widths are impracticable without thorough investigations of local conditions. Your committee, however, has investigated many cases which are so flagrant that very little investigation is required. The use of a 65-ft. brick paved roadway on the principal through street of a municipality having a population of only 2,400, constitutes a typical example. This practice appears to be very common in many cities throughout the Middle West.

Closely related to the subject of widths of roadways of the principal through traffic streets of municipalities is the utilization of by-pass highways, both within and without the municipal street system. The object of a by-pass highway is to divert through traffic from the principal business streets, especially where such streets are used to their capacity limit by local traffic. This subject was given thorough consideration at the Third International Road Congress held in London in 1913. The following conclusion pertaining to this subject was unanimously adopted by the delegates from all important countries of the world:

"As a general principle, it is better that new main roads be constructed to pass outside rather than through towns, and that, where an existing main road passing through a town is unsatisfactory for through traffic, it is often better, in preference to widening an existing narrow main road through the center of a town, that new roads should be planned according to the principles of the science of town planning."

Your committee indorses the conclusion just quoted. While it is true that many American municipalities favor through traffic utilizing their main business streets, from the standpoint of the possibility of securing trade thereby, it is believed that this attitude will not be justifiable in the near future. In the United States, prior to the war, through traffic consisted primarily of touring cars. The Third International Road Congress, however, had in mind the broad development of highway transport, as in England particularly the main county highways leading into municipalities had been subjected for several years prior to 1913 to various types of commercial highway transport, such as intercity haulage, long and short haulage of farm products and other commodities, and rural motor express. Municipal authorities, therefore, should not base their decision pertaining to the advantages and disadvantages of by-pass highways upon traffic consisting of touring cars, but should consider the phenomenal development of commercial highway transport which this country is now witnessing and should give special thought to the desirability or undesirability of its business streets carrying in the future an increasing commercial motor traffic consisting of motor trucks, tractors and trailers ranging in pay load capacity from ½ to 7½ tons. A canvas of the municipalities represented in the society indicates that comparatively few cities are considering the utilization of by-pass highways. However, it is found that the following cities have either constructed or are planning by-pass highways: Baltimore, Md.; Binghamton, N. Y.; Buffalo, N. Y.; Columbus, Kan.; Elizabeth, N. J.; Houston, Tex.; Memphis, Tenn.; Newark, N. J.; Pawtucket, R. I.; Pittsburgh, Pa.; Plainfield, N. J.; St. Catherines, Ontario; and Syracuse, N. Y.

Municipal engineers and officials are well aware of the intimate relationship between the design of

(Concluded on Page 240)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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No. 20

THE NEXT INTERNATIONAL ROAD CONGRESS

Some weeks ago the matter of holding the next international road congress in this country was discussed on this page and in an article by Prof. Arthur H. Blanchard, of the University of Michigan. As pointed out at that time, the congress will not be held here unless an invitation is extended officially by the United States Government and that step cannot be taken unless Congress acts before the first of next year.

Road builders, we believe, are practically unanimous in their opinion that the next meeting should be held here. It is difficult to see why anyone else should oppose the extending of the invitation by the Government or should object to the Congressional action enabling the Government to take that step. The whole matter would seem to be one of getting the subject to the attention of Congress and of expediting action by that body.

Everything that can be done by the road builders of the country to get the next meeting here should be done. And it is necessary to get action in the near future. Concerted effort, through the various road building organizations, is desirable, but much can be done by state and city road and street departments and by individual engineers.

SELECTING MEN FOR MAINTENANCE WORK

Selecting men to have charge of maintenance work is much more difficult than choosing heads for construction departments, because the qualifications necessary for the two kinds of work are very different.

The engineer is primarily a constructor. His choice of engineering as a life work indicates a predilection for construction and his education and training are directed chiefly towards designing and building. If he is a good engineer and is given an opportunity to exercise his talents under pleasant conditions he takes a lively interest in construction, but is likely to lose that interest when the structure is completed.

A very different and somewhat rare temperament is required for maintenance. Comparatively few engineers have it. When one is found in a highway engineering organization, he should be transferred to the maintenance department, given ample pay and retained in the service regardless of other considerations.

OVERLOADING MOTOR TRUCKS

In certain fields it is the rule rather than the exception to overload motor trucks, according to an authority whose views upon the evils of that practice are given elsewhere in this issue. Makers of motor trucks realize that continuing to load trucks in excess of their rated capacities is a bad practice sure to be followed by bad effects and operators really anxious to get the best results from their vehicles should heed the warnings given them.

One of the most common reasons for overloading seems to be a belief that it pays. A man with a 3-ton truck apparently feels that he is making a little extra money by carrying 3½ or 4-ton loads. Nothing could be farther from the truth, as is pointed out in the article to which reference has been made. In the first place, such loading increases the likelihood of accident. Not only does it put undue strains on various parts, but it makes it difficult to control the machine in case of minor breakage. In the second place, a truck is a machine that is built to perform certain work and though it will take care of extra work upon occasion, habitual overloading wears it out before its time.

Overloading would be less serious if all roads were good and if all drivers were careful and efficient. Both roads and drivers are uncertain factors, however, and it is poor economy to add excessive loads to bad roads and unskillful, careless driving. When that is done, the truck cannot be expected to render the maximum service of which it is capable.

Highway Work in Lenoir County, North Carolina

With a road fund of $2,000,000, Lenoir County, North Carolina, is carrying out an extensive road building program. About 70 mi. of asphalt and concrete roads are included in the program, which is expected to be completed next year.

West Virginia Passes Road Amendment

The constitution of the State of West Virginia was amended by a large majority on Nov. 2, permitting the Legislature to issue bonds up to $50,000,000 for the construction of a state highway system. Under the system to be used in the construction of these roads, supervision will be vested in the State Road Commission.

Bonds will be issued from time to time as road construction progresses and it is expected that motor vehicle fees will pay the interest and retire the bonds as they mature.

Highway Traffic and Transport Problems

(Concluded from Page 238)

streets and the installation of car tracks therein. The extension of the street railway service presents grave problems in many municipalities, especially in the case of extensions on streets whose roadways were not designed with a view to the installation of car tracks. In the consideration of the extension of transportation services, your committee recommends that thorough consideration should be given to the utilization of motor bus routes. Here again, we find that many English municipalities have had motor-bus routes installed for many years and hence it is practicable to secure a large amount of valuable data pertaining to operation from English sources. In this country, the development has been slower but we have, at the present time, several notable examples of efficient motor bus services, among which may be mentioned those of New York City, Newark and Detroit. A canvass of the municipalities represented by the membership of the society shows that motor buses, with seating capacities for ten or more persons, are operating in the following cities: Asheville, N. C.; Austin, Minn.; Baltimore, Md.; Binghamton, N. Y.; Birmingham, Ala.; Bloomfield, N. J.; Cleveland, O.; Detroit, Mich.; Elizabeth, N. J.; Elcott, Ind.; Elmira, N. Y.; Kansas City, Mo.; Kingston, N. Y.; LaGrange, Ga.; Lorain, O.; Los Angeles, Cal.; Louisville, Ky.; Miami, Fla.; Minneapolis, Minn.; Newark, N. J.; New Britain, Conn.; Newport News, Va.; New York, N. Y.; Norwood, Mass.; Ottawa, Canada; Pittsburg, Kan.; Pittsburgh, Pa.; Plainfield, N. J.; Richmond, Ind.; Rochester, N. Y.; San Antonio, Tex.; Wichita, Kan.; Wilkes-Barre, Pa.; and Winnipeg, Canada.

A Kentucky County Votes Road Bonds

Letcher County, Kentucky, on Nov. 2 cast a large vote authorizing the issuance of $300,000 county road bonds for the construction of a county system of highways. Among the highways which will be improved is that along the North Fork of the Kentucky River, extending from Pound Gap to Winchester, a distance of 200 mi.

Baltimore Votes $6,500,000 for Streets and Bridges

The City of Baltimore, Md., at the recent election voted for the issuance of $51,750,000 bonds for public improvements, of which amount $6,500,000 will be expended in road and bridge construction. Of this amount, $3,000,000 will be spent on work in the city proper and $3,500,000 will be spent in the Annex.

$60,000,000 Road Bond Issue Carried in Missouri

The amendment of the constitution of the State of Missouri authorizing the issuance of $60,000,000 of bonds for hgihway improvement, was ratified by the voters of the state at the general election. The largest vote for the measure was recorded in the cities, considerable opposition coming from the rural districts.

Minnesota Passes Babcock Amendment

The voters of the State of Minnesota at the general election ratified the Babcock road amendment to the state constitution, authorizing the construction of a state system of highways 6,900 mi. in length. Under the provisions of this amendment not more than $10,000,000 of road bonds may be issued in one year and not more than $75,000,000 may be outstanding at one time, otherwise there is no restriction of the cost or time of completion of the highway system.

California Passes Law Authorizing Change in Interest on Road Bonds

The voters of the State of California at the general election ratified a law permitting the adjustment of interest on highway bonds to meet market conditions, such interest rate not to exceed 6% and the bonds to be sold for not less than par.

This action puts an end to the difficulties which have confronted California in the disposal of its highway bonds. Under the provisions of this act a state highway finance board will be created, which will determine the rate of interest on bond issues.

A clause in the above act relieves the counties of the state from paying interest on state highways in their respective territories, as was done formerly.

Good Roads Amendment Defeated in Washington

The proposed amendment to the constitution of the State of Washington providing for the issuance of $30,000,000 bonds, was defeated at the general election. The bonds were to have been issued to mature in 20 years, motor vehicle fees to be used in meeting the interest of and maturing the bonds.

Georgia Passes City Paving Law Amendment

The constitution of the State of Georgia was amended at the general election on Nov. 2, so as to permit cities having a population of more than 150,000 to issue 10-year bonds for street paving. It is expected that great stimulus will be given street paving by the passage of this amendment.

Big Minnesota Bridge Nears Completion

The Cedar Avenue Bridge, situated a few miles south of Minneapolis and spanning the Mississippi River, will soon be completed. This highway bridge is a steel structure, consisting of five spans, each 170 ft. in length, with a 20-ft. concrete roadway. Work was started in October of last year under supervision of E. J. Miller, Assistant County Engineer of Hennepin County.

Virginia Passes Road Law Amendment

By an overwhelming majority the people of Virginia on Nov. 2 amended the state constitution so as to permit the General Assembly to issue bonds for highway purposes.

It is expected that the General Assembly will issue $50,000,000 of road bonds for highway construction covering a period of five to six years. This amount, with additional funds available from other sources, will make available about $80,000,000 for highway construction during the above period. The first work undertaken will be the improvement of the trunk highways in the state.

New Jersey Votes Tunnel Bonds

The State of New Jersey passed on November 2 by a large majority the $28,000,000 bond issue for the vehicular tunnel under the Hudson River between Jersey City and New York City and for the bridge between Camden and Philadelphia across the Delaware River. According to the provisions of the act tolls will be levied at both the tunnel and bridge to pay interest on and mature the bonds.

This action of New Jersey will permit the work of constructing the proposed tunnel to go forward without delay. Ground was broken on Oct. 12 at the site of one of the ventilating shafts in New York City on a preliminary contract.

Morgan County, Alabama, Authorizes Bonds

At the general election in Morgan County, Alabama, a $440,000 bond issue for highway improvements was carried by a small majority.

Susquehanna County, Pennsylvania, Votes Bonds

On Nov. 2 the County of Susquehanna, Pennsylvania, authorized the issuance of $1,000,000 of bonds for highway improvement.

Rural Road and Bridge Expenditures

$400,000,000 Spent During 1919 on Rural Roads and Bridges in the United States

During the calendar year 1919, over $400,000,000 was expended in 46 states on rural roads and bridges, according to the U. S. Bureau of Public Roads. This total is made up of the actual cash expenditures for such items as labor, materials, supervision and administration, amounting to $389,455,931, and convict labor and statute labor, the value of which, not definitely known, is estimated at $132,000,000. So far as possible, all expenditures on city streets within incorporated towns and cities and all items of sinking fund payments or the redemption and interest payments on road and bridge bonds have been excluded.

The road and bridge expenditures for 1919 show an increase of approximately 33 1/3% over those of 1918 and 70% over those of 1914. More striking, however, is the increase in the total proportion of the total funds supervised by the several state highway departments. In 1918 the expenditures by or under the supervision of the state highway departments amounted to $117,285,268, while the local road funds, over which they exercised no control whatever, amounted to $168,812,925. In 1919, however, the state highway departments supervised the expenditure of $200,292,694 as against the total of $189,163,237 expended by the local road and bridge authorities.

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Governor Lowden of Illinois recently applied cement moistened with water from the well at Sagamore Hill, Long Island, where Colonel Roosevelt obtained his drinking water, to the last foot of the Roosevelt Road between Chicago and Wheaton.

Citizens of Porter County, Indiana, are agitating a movement for an improved road traversing the entire width of the county. The road is estimated to cost $1,000,000 and is being petitioned for under the county road unit law. The present highway with a water-bound macadam surface carries considerable traffic between Chicago and points in Michigan.

HIGHWAY TRANSPORTATION

Evils of Trucks Overloading

Transportation Engineer of Packard Motor Car Co. Discusses Effects of Overloading on the Machine Itself and Its Operation

The evils of overloading motor trucks are discussed in an article by F. C. Horner, Transportation Engineer, of the Packard Motor Car Co., printed in a pamphlet recently issued by the Motor Truck Committee of the National Automobile Chamber of Commerce, New York, N. Y. [The pamphlet also includes a shorter article on the same subject by Robert O. Patten, Sales Manager of the Pierce-Arrow Motor Car Co., which was printed in full in

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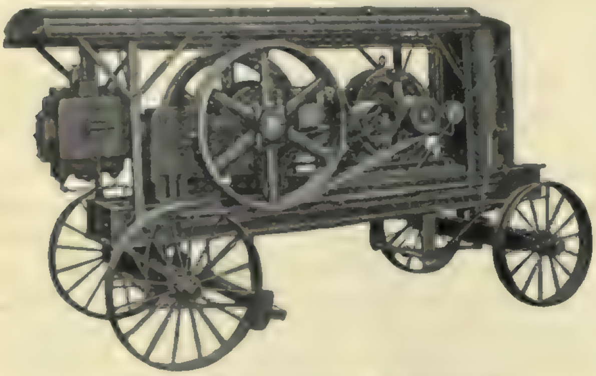
Sullivan Portable Air Compressor

The Sullivan portable electric air compressor, shown in the accompanying ilustration, is equipped with either D. C. or A. C. motors and is made in several sizes, from 100 to 250 cu. ft. of air per minute. The compressor and motor run at constant speed and when the pressure in the receiver exceeds the set limit, the pilot valve on the side of the air cylinder raises the inlet valves from their seats, thus allowing the piston to reciprocate without load until the pressure falls. The compressor is the standard No. 6 Sullivan single stage belt-driven compressor.



SULLIVAN PORTABLE ELECTRIC AIR COMPRESSOR

The inlet and discharge valves are of the improved Sullivan wafer pattern, consisting of thin rings of spring steel held in place by curved annular steel springs. This arrangement affords a very short valve travel and a relatively wide opening, furnishing excellent volumetric efficiency.

The air cylinder is cooled by a hopper jacket open at the top and is filled from a bucket, thus eliminating piping and circulating pump. The main working parts of this equipment, which is manufactured by the Sullivan Machinery Co., Chicago, Ill., are oiled by the splash system.

Standard Motor Truck Company Announces Reduction of Truck Prices

Following closely upon the announcements of reduction of the prices of many passenger automobiles, the Standard Motor Truck Co., Detroit, Mich., has announced a reduction of about 10% in the prices of Standard trucks.

"This reduction was made to assist in the country-wide movement to reduce prices," said F. J. Fisher, Secretary and Treasurer of the company, "and will not have any effect on wages.

"We do want to pose as philanthropists when we tell that this action was taken in spite of the fact that all but two of our sources of supply informed us that they could foresee no reduction in their prices.

"But we sincerely believe that this is the only way of ever bringing prices back to a normal basis, and we anticipate that our other sources of supply will soon join this movement."

The Blaw Bulldog Bucket

A folder containing a description and specifications of the Blaw Bulldog bucket has recently been issued by the Blaw-Knox Co., Pittsburgh, Pa. This bucket was formerly built with a head of structural steel, but is now equipped with an annealed cast steel head. It is used extensively in handling broken stone, sand and gravel.

The Heil Hydro Hoist

The Heil Hydro hoist for motor trucks consists of one or two vertical cylinders, depending upon the location of the propeller shaft of the truck, mounted on the chassis frame just in front of the rear axle and about in line with the front shackle of the rear spring. The power to create the pressure is taken from the front propeller shaft or transmission near the center and is applied by operating a control lever in the driver's seat. Oil is used in making the "hydraulic" pressure.

W. D. TRUCK WITH HEIL HYDRO HOIST

The cylinders of the hoist are directly under the end of the truck body, acting directly upon it. Accordingly, the number of working parts are few and no cables, pulleys, etc., are required. The tested lifting force of the hoist is double the maximum amount of any load placed upon the truck.

The accompanying illustration shows an F. W. D. truck equipped with the Heil hoist. This truck is one which the State of Tennessee received from the Government.

The Heil Hydro hoist is manufactured by the Heil Co., Milwaukee, Wis.

MEETINGS

Calendar of Coming Meetings

Dec. 13-16,—American Association of State Highway Officials,—Sixth annual convention, Washington, D. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

Jan. 25-27.—Associated General Contractors of America.—Annual convention, New Orleans, La. Chicago, Ill.

American Road Builders' Association

The annual meeting and "get together" dinner of the American Road Builders' Association was held on Nov. 15 at the Automobile Club of America, New York City, with about 70 members and guests in attendance. Much enthusiasm was shown by both the speakers and members, especially in regard to the next convention, to be held in Chicago, Ill., during the week of Feb. 7, 1921.

Following the meeting of the Board of Directors at 3:00 p. m., the annual business meeting was held, at which the reports of the secretary, treasurer and executive committee were presented.

The dinner was held at 7:00 p. m. with Senator James H. MacDonald, Treasurer of the association, as toastmaster. Under the direction of a local song leader, popular songs were sung before the dinner and between courses, and everyone made merry.

After the dinner the tellers reported the election of officers as follows: President, M. J. Faherty, President, Board of Local Improvements, Chicago, Ill.; Vice Presidents: Northeastern District, J. A. Duchastel, City Engineeer, Outremont, Canada; Southern District, Lt. Col. H. L. Bowlby, Chief, War Materials Division, Bureau of Public Roads, Washington, D. C.; Central District, Robert C. Terrell, State Engineer of Oklahoma, Oklahoma City, Okla.; Western District, S. Benson, Chairman, Oregon State Highway Commission, Portland, Ore.; Secretary, E. L. Powers, Editor, GOOD ROADS, New York, N. Y.; Treasurer, Senator James H. MacDonald, New Haven, Conn. Directors for three years were elected as follows: Northeastern District, Irving W. Patterson, Chief Engineer, State Board of Public Roads, Providence, R. I.; William R. Smith, President, Lane Construction Corp., Meriden, Conn., and John Swan, Director of Public Works, Pittsburgh, Pa.; Southern District, J. H. Cranford, President, The Cranford Paving Co., Washington, D. C., and W. G. Sucro, County Roads Engineer, Baltimore County, Towson, Md.; Central District, W. A. McLean, Deputy Minister of Highways, Province of Ontario, Toronto, Ont., Canada; Western District, Austin B. Fletcher, State Highway Engineer of California, Sacramento, Cal.

The first speaker after the dinner was the new president, M. J. Faherty, who outlined the great road building plans of the State of Illinois and the

DINNER AT THE ANNUAL MEETING OF THE AMERICAN ROAD BUILDERS' ASSOCIATION, NOV. 15, AT THE AUTOMOBILE CLUB OF AMERICA

City of Chicago. Mr. Faherty has been very active in securing good roads for Illinois and expressed the desire to have the state project even greater highway improvements than now planned. The new president was very enthusiastic over the next convention of the association to be held in Chicago during the week of Feb. 7, 1921, stating that he would do everything in his power to make it the greatest meeting ever held by the association. Mr. Faherty assured the members that he would arouse the interest and cooperation of state and city officials in the Chicago convention.

H. G. Shirley, Secretary of the Federal Highway Council, spoke upon the urgent need of research in highway work. Foundations, subgrades and surfacing materials are as yet little understood and money ought to be set aside to investigate these problems. He also pointed out that many states have not as great wealth as has the State of Illinois, hence the construction of highways by the Federal Government will do much in aiding the good roads movement in these states.

D. C. Fenner, representing the National Automobile Chamber of Commerce, discussed the road problem from the standpoint of the motor vehicle owner, saying that sharp curves should be eliminated, grades should not be more than 5% and all bridges should be able to support 20 tons. More attention, the speaker said, should be paid to the matter of securing adequate foundations, instead of trying to spread the money out over large mileage with inadequate foundations.

W. E. Albig, of the U. S. Chamber of Commerce, spoke upon the relation of transportation to the progress of a community, pointing out that good roads greatly facilitate the distribution of food products.

T. W. Dieckman, of the Lakewood Engineering Co., spoke upon the desirability of moving road materials in winter when more open top cars were available than in the summer. By getting road materials on the job in the winter and early spring, road work would not be subjected to the costly delays arising from a shortage of materials due to railroad congestion.

Associated Highways Contractors of Pennsylvania

At a recent meeting of the Associated Highways Contractors of Pennsylvania, the following officers were elected:

H. H. Wilson, of Hughesville, President: Benjamin Harrison, of Derry, D. Rathbun, of South Bethlehem, H. S. Souder, of Lancaster, W. J. Wiseman, of Pittsburgh and W. Horn, of Erie, Vice Presidents; H. S. Harding, of Harrisburg, Secretary, and S. M. Irwin, of Philadelphia, Treasurer.

New York Motor Truck Show

The Motor Truck Association of America will hold a motor truck show Jan. 3-8, 1921, in the Twelfth Regiment Armory, New York City. Lectures will be held on various problems of motor truck transportation and a committee has been appointed to consider ways of remedying the congestion of the streets of New York City.

Highway Contractors' Association of New Jersey

About 100 members of the recently organized Highway Contractors' Association of New Jersey met at a dinner on Nov. 4 in Trenton, N. J.

John M. Kelley, of Camden, is president of the association; Joseph F. Burke, of Plainfield, vice president, James J. Barrett, of Trenton, treasurer, and A. B. Whelan, of Trenton, secretary.

PERSONAL MENTION

L. C. Register has resigned from the Florida State Road Department.

K. S. Macdonell, Town Engineer of Barrie, Ont., Canada, has resigned.

James M. Begg has been appointed city engineer of Brandon, Man., Canada.

C. E. Benson has resigned as district engineer of the Nevada State Highway Department.

Ira Rogers has been appointed resident engineer of the Kansas Highway Commission, with headquarters at Garnett.

R. S. Dahlberg has been apointed resident county engineer in charge of construction work in Atascosa County, Texas.

OBITUARY

George E. Datesman, formerly Director of Public Works, Philadelphia, Pa., died recently at Germantown, Pa.

George M. Ingram, Vice President of Warren Brothers' Company, Boston, Mass., died on Oct. 28 at his home in Nashville, Tenn. Mr. Ingram had been connected with the Warren Brothers Company since 1902.

L. B. Jones, Assistant Engineer in charge of bridges of the Maine State Highway Department, was killed in an elevator accident on Oct. 12, in Portsmouth, N. H., where he was attending a conference on the proposed interstate bridge.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

PUBLISHED EVERY WEDNESDAY BY
THE E. L. POWERS COMPANY
E. L. Powers, Pres. O. D. Conklin, Secy.

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Concrete Bridges and Culverts
By H. GRATTAN TYRRELL
Flexible Leather, 4½x6½ inches, illustrated. $3.00 postpaid
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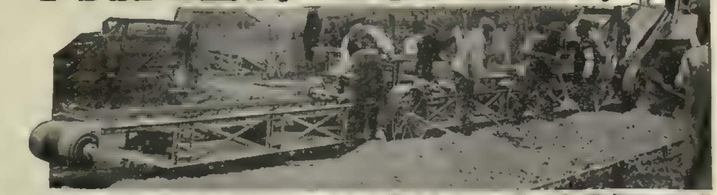
GRANITE
THE MOTOR TRUCK HIGHWAY

NOW COMES THE PROBLEM OF MAKING OUR INTER-CITY HIGHWAYS MEET THE REQUIREMENTS OF HEAVY TRUCK DUTY

GRANITE PAVING BLOCK
MANUFACTURERS' ASSOCIATION
OF THE UNITED STATES, INC.
JAMES J. TOBIN, Field Engineer
31 STATE STREET BOSTON, MASS.

KOEHRING
MIXER LOADER



Cuts out all wheelers—makes a worthwhile labor-saving—speeds up the operation of the mixer

THE Koehring Mixer Loader precedes mixer under its own power. Materials are shoveled into bins on the frame, movable along frame. Measures sand and stone by striking off. Bins are adjustable for any proportion of "mix;" any capacity of mixer. Materials fed through bottom gate of bins to belt conveyor that carries materials to mixer at speed of 500 feet per minute. Write for catalog.

Koehring Machine Co.
Milwaukee, Wis.

What Will the Winter Do to Your Roads?

IF your roads are marred and scarred from summer traffic, prompt patching with "Tarvia-KP" will heal the breaks and make them proof against the destructive winter frosts.

"Tarvia-KP" used *now* means time, labor and money saved in the Spring. It prepares your roads to withstand winter's hard usage and enables you to get an early start with your "Good Roads Program" of surfacing and new construction.

"Tarvia-KP" is known as the road-maker's "Cure-All". It is wonderfully effective for every type of road—quick-acting, always ready; requires no heating and is extremely easy to handle.

Batches of the mix can be made up in spare moments and used whenever the roads are free from snow. Freezing does not injure it.

If you have a road problem put it up to our Special Service Department. Illustrated booklet showing each step in patching a road with "Tarvia-KP" free upon request to nearest office.

Tarvia-KP
FOR COLD PATCHING

The Barrett Company

New York Chicago Philadelphia Boston St. Louis
Detroit New Orleans Birmingham Kansas City Minneapolis
Seattle Peoria Atlanta Duluth Salt Lake City
Lebanon Youngstown Milwaukee Toledo
Bethlehem Elizabeth Buffalo Baltimore Omaha
THE BARRETT COMPANY, Limited: Montreal Toronto Winnipeg Vancouver

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Dallas Nashville Syracuse
Bangor Washington Johnstown
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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Asphalt Pavement Construction on an Illinois State Highway and the Chicago Boulevard Link*

By JOHN B. HITTELL†

For purposes of comparison, and perhaps for future study, members of the society may be interested in a brief description of two types of asphaltic construction, each of which, it is believed, will carry a large amount of traffic. While there is nothing exceptionally unusual in the designs, in one case a rather unusually rich mix was used in the cement concrete foundation, and in the other case an attempt was made to secure a "stiff" top mixture.

One pavement is on a highway improvement contracted for by the Illinois State Highway Department during 1919 and the other is a part of the $15,000,000 Boulevard Link improvement of the City of Chicago. One is a suburban road with unrestricted traffic, of an unknown amount, and is sparsely policed. The other is a metropolitan street, with restricted but intense traffic that at times is all it can carry. An asphaltic concrete pavement and a sheet asphalt pavement, with binder courses of equal thickness, are placed against each other, and future study may throw important light on their relative values.

Asphaltic Concrete

It is customary for the Illinois State Highway Department to call for bids on alternate types, viz., Portland cement concrete and bituminous concrete, specifying that the latter, with a wearing course 2 or 3 in. thick, shall be laid on the same mix of concrete as the cement concrete pavement, but also specifying that the concrete for the foundation shall be 1 in. less in thickness than that specified for the cement concrete pavement.

MICHIGAN BOULEVARD, CHICAGO, ILL., NORTH FROM ONTARIO STREET
PHOTOGRAPH TAKEN IN SEPTEMBER, 1920

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*Partial abstract of a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†District Engineer, the Asphalt Association.

In 1919 bids were called for four sections of a federal aid project on what is known as the Chicago-Waukegan-Milwaukee Road. The R. F. Conway Co., of Chicago, was awarded contracts for sections A and B, asphaltic concrete, and sections C and D, cement concrete. The bids on the asphaltic pavement were about $7,200 per mile greater than those for the cement concrete pavement. The authorities in charge probably decided to take advantage of the opportunity to compare the two types, as the conditions were ideal—the same soil, traffic, and width of roadway; a thoroughly equipped and experienced contractor; and the fact that the asphalt pavement would connect at each end with cement concrete pavements.

Section A, at the southerly end, comprises 48,507 sq. yd. of pavement, and Section B, adjoining, comprises 36,929 sq. yd. The two sections have a combined length of almost 8 mi. To avoid repetition hereafter, these two sections will be referred to as the road, being the only part of the job considered here.

The road starts from a concrete pavement at the village of Techny and extends through Shermerville and Deerfield to Everett, passing through typical Illinois farming country. It was formerly an old macadam highway, with the exception of 4 mi. between Deerfield and Everett, which is new location. The old macadam varied in width, but was everywhere narrower than the finished road, and, on account of the cut, is of no material value as a support for the pavement. The soil is everywhere of clay, and the drainage is similar to that of other roads built in the state, consisting of side ditches, cross culverts, etc.

During grading long stretches of light cutting were encountered. A large Koehring grader was employed, resulting at times in loading 3-yd. wagons at a rate of 75 an hour. At the end of one cut, where a 3-ft. fill was made, the soil was such that horses mired themselves and were unable to move. This was overcome by employing a large "Caterpillar" tractor that hauled three wagons.

During the first part of 1920, the contractor installed a central mixing plant consisting of two 4-bag mixers. The concrete was hauled 2½ mi. by truck and deposited on the grade. This worked successfully on the earlier part of the work, but later had to be abandoned because of inability to secure enough materials to operate the mixer simultaneously.

At the present writing (August, 1920) concrete is being laid southerly from Everett, the materials being hauled by truck. The truck used consists of a Ford chassis on which is mounted a body containing one batch of four bags of cement, with enough sand and stone to make a 1:2:3½ mixture. The truck is loaded first with the cement and then is taken to the sand car where the sand, previously shoveled into a box attached to the side of the car, is dumped in. This box is readily moved about on the side of the car and holds twice the portion of cement. The necessary amount of coarse aggregate is added, being gauged by the size of the body. About 25 of these trucks are employed and are equipped with 4½-in. pneumatic tires on the rear wheels to help compact the subgrade. The line and grade are maintained by steel forms, the exact grade being secured by a strike-board. The condition of the subgrade is excellent, though there is practically no rolling of the fine grade.

The concrete is 6 in. deep at the sides and 7 in. in the center, the difference forming the crown. On tangents, the subgrade is flat, but the 1920 state specifications call for cement concrete pavement uniformly 8 in. in thickness, with a crowned subgrade, and for 7-in. foundations for bituminous pavement.

On curves, the road being 18 ft. wide, the roadway is superelevated as follows: 6° 30′, 15 in.; 6° 0′, 13¾ in.; 5° 30′, 12⅜ in.; 5° 0′, 11¼ in.; 4° 30′, 10⅛ in.; 4° 0′, 8¾ in.; 3° 30′, 7⅜ in.; 3° 0′, 5⅞ in.; 2° 30′, 4⅜ in.; 2° 0′, 2½ in. The rise on curves of 7° or more is 1 in. per foot of width. The maximum grade is not over 3%, except at bridge approaches where it is 4½%.

At the time the work was observed, the concrete was not as stiff as might have been expected, but this, it was explained, was due to the excessively hot day and the fact that the gravel was running a trifle small. This was remedied by a change of gravel. A Lakewood mechanical tamper has been used, but at the time stated compression was obtained by a large wooden tamper operated by two men.

In the original specifications no provision was made for a curb, but by a change made later a curb is being built integral with the foundation. The curb is 4 in. wide and its height is made a little less than 3 in. in order that the wearing course may be thoroughly compacted at the edge of the curb.

The average progress of the foundation and curb is over 400 ft. daily. Last fall, when the work was started, brooms were used to roughen the surface, but this method was superseded later by the hand roller method. The roller, designed by District Engineer G. N .Lamb of the State Highway Department, consisted essentially of 5 ft. of 10-in. iron pipe, sealed at both ends, to which were attached at intervals of 5 in. ordinary 1-in. angle irons. The concrete is cured by the use of wetted tarpaulins and, later, flooding. Earth is not used, as it is considered impossible to remove it satisfactorily from the rough concrete surface.

In 1919, 4,000 ft. of roadway were laid. The concrete work was started on Sept. 24 and the binder and top were laid during the week of Nov. 20. Because of the lateness of the season, the contractor brought these materials from his Elston Ave. plant

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Vol. XX NOVEMBER 24, 1920 No. 21

A SERVICE TEST OF CEMENT AND ASPHALTIC CONCRETE

The building of part of a highway that should prove of especial interest to those in a position to observe it is described elsewhere in this issue in an abstract of a paper presented by John B. Hittell, of the Asphalt Association, at the meeting of the Amercan Society for Municipal Improvements last month.

The road in question is situated in Lake and Cook Counties, Illinois, and connects Chicago and Milwaukee, passing through Waukegan. Naturally, it is expected to carry heavy traffic. Adjoining sections are of cement concrete and asphaltic concrete, put down by the same contractor under conditions "as equal as can be had," according to Mr. Hittell.

Therein lies its interest, for, if conditions remain essentially the same, there will be an unusual opportunity to compare the behavior of the two types of pavement. While many "test roads" have been built, using various materials and construction methods on short sections of continuous highway, comparatively little actual work comparable to that on the Chicago-Waukegan-Milwaukee Road has been done and subjected to subsequent study. And without in any way depreciating the value of these experiments, it is doubtful if they will ever furnish as valuable criteria as can be furnished by service tests.

THE INTERNATIONAL ROAD CONGRESS

Only a little over a month remains in which to take the steps necessary to insure the holding of the next international road congress in the United States. As has been set forth previously, Congress must take the required action before the first of next year. It will help if every road builder will see to it that the desirability of a law enabling the Government to extend an invitation is brought to the atention of the Congressman from his district.

SNOW REMOVAL IN SMALL CITIES

Already, in some northern cities, traffic has been more or less seriously impeded by snow. In many cases there would have been little or no difficulty if street railway and city authorities had been prepared for snow removal work.

While this illustrates the necessity of making such preparations well in advance—a measure that has been urged repeatedly in these columns—that is not the point it is desired to emphasize here. While there is probably ample time to do a good deal in the way of preparing to cope with the snow problem in most localities, most of the preparatory work should have been done some time ago in order to be of the maximum effectiveness. What it is desired point out is the need for more efficient snow removal in the smaller cities.

In a great many municipalities of moderate size the street authorities make little if any attempt to faciltate travel, even on the principal streets. Conditions are particularly bad on streets in which there are car tracks. . The street railway companies clear their tracks by means of plows and sweepers that pile up the snow on each side of the track or tracks. This often leaves the street railway area the only portion of the street passable for automobiles and motor trucks. Where there is only one track in the street, this means that when motor vehicles meet one or both must get out into the piles of snow on the side.

Under the conditions obtaining when all travel was by means of horse-drawn vehicles, and the total volume of winter traffic was comparatively light, this practice caused little public inconvenience. At present, when motor vehicles are used throughout the winter months it should be changed. Motor traffic has assumed proportions that demand conconsideration. Much of it is business traffic and some of it is vital to the public welfare.

It is manifestly impracticable for the smaller cities to clear completely all their streets, even all those in which there are car tracks. The cost would be prohibitive. It would be possible, however, to remove enough of the piled-up snow along the tracks to permit the operation of motor vehicles. Part of the cost should be borne by the street railway companies, for while they must keep their tracks clear, they should be obliged to do so without blocking public thoroughfares. Though such work undoubtedly would add to the public's tax burden, the additional cost would be a good investment.

Asphalt Pavement Construction On An Illinois Highway and the Chicago Boulevard Link

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in Chicago, hauling them 17 mi. in 7½-ton trucks. The penetration varied from 56 to 68.

In order to finish 7 mi. of binder and top this year, the contractor installed, at Deerfield, a 1-car Cummer plant having a capacity of about 200 tons, or 700 lin. ft. of completed bituminous work. The haul will average about 2 mi. Two tanks, each of about 18,000 gal. capacity, one for fuel oil and one for asphaltic cement, will be used to guard against intermittent supply.

The construction of the asphaltic road and the connecting cement concrete road by the same contractor and under conditions as nearly alike as possible will give an exceptional opportunity for observing the effect of different factors upon the pavements.

A traffic census at a point 15 mi. from City Hall on Sunday, Aug. 8, and Monday, Aug. 9, showed a total of 11,451 pleasure cars and 540 motor trucks on Sunday and 2,442 pleasure cars and 279 motor trucks on Monday. Neither of these days probably was as good as any of the remaining five of the week for ascertaining the amount of trucking, since business is very generally suspended on Sunday.

Sheet Asphalt

The sheet asphalt pavement described is on the north and south approaches to the new Boulevard Link Bridge, and was laid in connection with the widening and extension of Michigan Ave. and Pine St., from Randolph St. to Chicago Ave.

The roadways on Michigan Ave. and Pine St. were formerly 38 ft. wide, and all continuous traffic over them crossed the Rush Bridge which had two roadways each 17½ ft. wide. The roadway over the new bridge is 54 ft. wide. The north and south approach roadways are 80 and 85 ft. in width, respectively.

As soon as the rights to the property were obtained and the obstructions removed, preliminary work was commenced. The paving between Chicago Ave. and Ohio St., comprising 17,850 sq. yd., was laid between July 25 and Oct. 15, 1918. The remaining asphalt pavement on the approaches (progress on which was dependent upon the steel work) was finished early this year.

The rehabilitation of existing underground services and the installation of new ones, together with the old basements and sidewalk subareas, required special care in preparing the pavement foundation and the specifications provided for sand filling where directed by the Board of Local Improvements. The paving specifications provided for a 1:3:6 concrete base, 8 in. thick, and a 1½-in. binder course. The binder course was composed of stone from 1 in. down, sand, and bitumen, resulting in a mixture containing from 4 to 7% of bitumen, and from 20 to 30% of material passing a 10-mesh screen.

The grade on the approaches is less than 2%, and most of the work is on a level. On level stretches the crown of the 80-ft. roadway is 10 in., with a parabolic curve. On grades the crown was reduced to 9 in. These flat surfaces were provided to accommodate traffic comfortably near the curb lines — an additional reason being the assurance that the roadways, being boulevards, would be kept clean.

The pavement was guaranteed for two years, the guarantee providing that:

"As a basis for the interpretation of the satisfactory condition of the pavement during the period of the guaranty and at the expiration thereof, it is hereby agreed and understood that if the foundation and binder are sound, and the entire wearing surface of the roadway, shall possess a minimum thickness of seventy-five (75) per cent. of the original specified wearing surface and be in a smooth condition for travel and shall be free from cracks which show indications of disintegration of the wearing surface, it shall be considered as meeting the requirements of the said guaranty."

The improvement was made solely to accommodate plelasure car traffic between the two sides of the river and to provide separate roadways to and from the railroad freight yards.

The number of cars using the improvement is very large, the entire roadway being covered during the rush hours in the morning and evening. Speeds of 25 to 30 mi. an hour are common at these times and are not opposed by the police. The Chicago Motor Bus Co. operates a line of buses over it, the vehicles being of two types, weighing 10,500 and 11,500 lb. and having allowable ordinance capacities of 50 and 60 persons, respectively. Application has been made for permission to use a type of bus weighing 12,500 lb. and carrying 60 passengers. By ordinance, the schedule interval, except at midnight, is not more than 20 minutes, or "satisfactory service." As a matter of fact, during the morning and evening rush hours, the interval is about 2 minutes and during the rest of the day is about 10 minutes. The speed ranges from 15 to 20 mi. an hour.

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A Special Road District in California to include Sacramento, Yolo, Sutter and possibly Colusa and Glenn Counties, has been proposed, so as to permit the construction of a highway from Sacramento through the Sutter Basin to Red Buff.

Labor Conditions in the Middle West

A road laborer was walking down La Salle St., in Chicago, when the following sign in a book shop caught his eye, "Dickens' works all week for $40." The road laborer stopped and exclaimed to a bystander, "The devil he does! The dirty scab!"

Colorado Votes Good Roads Bonds

A state constitutional amendment providing for the issuance of $5,000,000 highway bonds was ratified on Nov. 2 by the electorate of Colorado. The bonds will bear 5% interest and one-half of the issue will be used on federal aid projects. The other half will be used in extending state aid to counties, the division of funds to be based on relative mileage.

Kansas Amends Road Law

An amendment to the constitution of the State of Kansas permitting the Legislature to enact laws to aid highway construction, was ratified by the voters of the state at the general election on Nov. 2. This amendment empowers the Legislature to pass laws permitting the state to pay 25% of the cost of the construction of highways, not to exceed $10,000 per mile for not more than 100 mi. in any county, excepting that in counties having an assessed valuation of more than $100,000,000, state aid may be given to 150 mi. of highways.

Good Roads Plans in North Carolina

At a recent meeting of the North Carolina Good Roads Association and the Citizens' Highway Association of North Carolina, it was resolved to carry on a vigorous campaign of publicity to stimulate interest in good roads in order to bring pressure on the next Legislature to provide for a state system of highways.

A bill will be drafted for introduction at the coming session of the Legislature, providing for the issuance of $100,000,000 of bonds to be used in constructing and maintaining a state system of highways, independently of the counties of the state.

Seek Law in Texas Permitting Use of Convicts on Road Work

A bill providing for the use of short-term convicts on the roads of Texas will be introduced at the next session of the Legislature by Representative I. B. Fairchild of Angelina County. In a recent statement, Mr. Fairchild said that the bill will provide that all convicts receiving from one to three-year sentences are to be employed the full time on the public roads of the county in which they are sentenced.

Mr. Fairchild also stated that he favored a state-owned cement mill, to be operated by convict labor.

Road Work in Utah

The State of Utah spent $3,424,184 during the year ending Nov. 30, 1919, according to a statement prepared recently by Joseph Ririe, State Auditor. Of this amount $640,606 was paid by the counties in the form of state road taxes.

New Jersey Civil Service Examinations

The New Jersey Civil Service Commission, Trenton, N. J., at its meeting on Nov. 17, directed that examinations be held for several important positions in the State Highway Department, as follows: Engineer in charge, Construction Division, $6,000; Engineer in charge, Division of Survey and Right of way, $4,000; Superintendent of Maintenance, $3,300; Supervisor of Maintenance, $2,700; Supervisor of Bridge Construction, $2,700; Bridge Foreman, $1,980.

To Plant Trees on California Roads

A system of tree and shrub plantng along the highways of California is being planned by the State Highway Commission, in cooperation with the State Forestry Bureau and the University of California. A committee to carry on the work has been appointed as follows: G. M. Homans, State Forester; A. B. Fletcher, Chief Engineer of the State Highway Commission, and J. W. Gregg, Professor of Landscape Engineering at the University of California.

New Jersey County Dedicates Roads To Honor Soldiers

To honor the memory of the soldiers in the Great War from Burlington County, New Jersey, three highways were dedicated on Nov. 12 as follows: the highway from Mt. Holly to Camp Dix, Argonne Highway; the highway from Mt. Holly to Camden, Marne Highway; the highway from Mt. Holly to Bordentown, Meuse Highway. Signs will be placed on these roads showing their respective names.

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Hampden County, Massachusetts, will relocate three stretches of road near Westfield.

The Pennsylvania State Highway Department, in cooperation with the Public Service Commission and the State Police, will start an investigation of the use of state highways by trucks acting as common carriers without certificates of public convenience.

The Railroads of Illinois have been denied for the second time a 40% increase in freight rates. The State Public Utilities Commission affirms its exclusive authority to regulate rates within the state and gives notice that its contention will be carried to the U. S. Supreme Court if necessary.

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston

Work is soon to be started on a score of street repair jobs in the outlying sections of Boston by city forces.

Simpson Bros., lowest bidders at $97,742.19, got the contract for paving part of Market St., Brighton. Mayor Peters also approved the award of a contract for paving the Jamaicaway, between Huntington Ave. and Willow Pond Road to the Warren Bros. Co., at $29,290.

Joseph Dufresne, aged 26, of 37 Orient St., Worcester, was killed on Oct. 28, when a 5-ton truck he was driving went through the floor of the Indian Orchard-Ludlow Bridge and plunged 40 ft. to the Chicopee River. Dufresne was pinned beneath the truck, which overturned in about 5 ft. of water. His brother, Eugene, also went into the river, but was able to clear himself from the truck in its fall and escaped injury.

The men were coming to Boston with a 5-ton load of oxygen tanks. On leaving Indian Orchard, they took a wrong road. They discovered their mistake when they reached the bridge, and tried to turn around upon it. The flooring gave way. The bridge is posted with notices limiting the load to three tons. Both the Boston and Ludlow fire apparatus were called to attempt to release the body of Dufresne.

The joint special committee on pensions, an unpaid recess committee of the Legislature, has estimated that the head of every family in Boston contributes $4.29 annually to pay the pensions of retired city employees. In addition, according to its estimates, 50 ct. more is paid for pensions of retired Suffolk County and state employees. The committee was appointed for the purpose of considering what changes, "if any, in the present laws should be made to make the present pension system of the commonwealth more uniform and equitable, and also the question as to whether or not all such pensions should be placed upon a contributory basis."

The committee has held preliminary hearings during the past three months throughout the state, giving its attention to the ideas of the public on the pension question and has made a thorough survey of exactly what the pension system costs. The committee consists of Senator Francis Prescott of Grafton, Chairman; Senator Wellington Wells, of Boston, Representative Charles H. Hartshorn, of Gardner, Henry L. Shattuck, of Boston, William H. Woodhead, of North Adams, and Wilfred J. Lamoreaux, of Southbridge.

The total cost of pensions in Massachusetts was about $720,000 in 1914. Today the total cost is more than $1,800,000. Boston paid $450,000 in pensions in 1914 and today is paying $670,000. All other cities of the state were paying $115,000 in 1914 and today are paying $360,000 in pensions.

Retired state employees were paid $120,516 in 1914 and this year are receiving $385,000. The counties of the state paid $20,000 in 1914 and will pay more than $45,000 to their retired employees this year. The towns of the commonwealth paid $15,000 in 1914 and will exceed $40,000 this year in pension payments.

The committee will prepare its recommendations to the incoming Legislature, following the final hearings. It finds that the question is still in its infancy and according to the rate of growth already maintained will amount to a staggering sum in a quarter of a century.

On Oct. 29, a largely attended mass meeting was held in the State Armory at Concord to protest the town's record high tax rate of $35 on $1,000, the third highest in the state, and to offer some means for preventing another big jump.

Charles G. Wood, formerly of the Board of Arbitration and Conciliation was the presiding officer. The speakers were Representative Benjamin Loring Young, of Weston, and George Albree of Concord, the citizens' candidate for representative.

It was the sense of the meeting that the committee appointed at the town meeting last spring to look into the advisability of appointing a finance committee or adoptng the town manager form of government report at once.

Boston city department heads who incur expenses in excess of the allowances in their budgets, without first obtaining the Mayor's approval, will in the future be requred to pay such expenses out of their own pockets. Mayor Peters sent an order to this effect to the department heads recently.

"The auditor," he said in the order, "has called my attention to a number of violations of the principle of the segregated budget. As a matter of fact, the instances that I have in mind are not only a violation of the budget system, but are actually illegal acts and they must be stopped immediately.* * * * * I appreciate, of course, that emergencies may arise calling for the necessity of expending a greater amount of money than is provided for in the various items in the budget, but the situation can be cared for if the department heads, before incurring bills in excess of the appropriation item, will secure my permission for the incurring of such bills. Unless my permission is thus secured, bills will not be paid."

Massachusetts is going to remove the snow from its highways this winter; not on every mile of highway throughout the state, but on the main traveled thoroughfares. That much was settled at a conference attended by about 100 men who were called together by Commissioner John N. Cole, of the Public Works Department.

It was a very interesting meeting. The state was represented by Chairman Cole and Frank D. Kemp and James W. Synan, his two associates. The chambers of commerce of a number of cities were represented. So were a number of other bodies, and individual truckmen also were present.

Mr. Cole opened the conference by making plain two things which had been misunderstood. First he showed that the removal of snow was not a question for the state. The law specifically states that it is a matter for the cities and towns and they have to pay the cost.

Next he pointed out that the $50,000 appropriated by the Legislature last spring was not to remove snow from the highways but to be expended in investigating how it might be done and trying to do it. With those two ideas cleared, the conference began.

Commissioner Cole stated that his department had purchased some 60 plows that could be attached to motor trucks. Also it has extra attachments and will buy a lot more to meet the occasion. Therefore, by planning at this time, he felt, some comprehensive scheme could be outlined for handling the matter through cooperation.

Then he called upon representatives of different bodies. Promises of cooperation were obtained from representatives from the section northeast of Boston; from Worcester and points between that city and Boston; from Springfield and from cities north of there along the Connecticut River; and from the district south of Boston.

It was brought out in the conference that many people thought that the state owned a lot of army trucks that might be utilized. But it was pointed out that these trucks are mostly of small tonnage, and that nothing less than a 3-ton truck can do anything with snow on a highway.

The proposition had been advanced that the state supply these trucks to different cities and have them fully equipped to go on the road at any time. Commissioner Cole pointed out that this could not be done because they are not big enough.

It was also learned that a number of private truck owners have plows; also that several cities have trucks and plows available for such use. Therefore, all present were asked to send within a week to Commissioner Cole the number of trucks in the different cities that may be used for snow work, and where such trucks are not available, what plans will be made to hire trucks.

When these data are all compiled Mr. Cole will allot a certain number of plows to different cities. Attachments will be placed on trucks so that it will be possible to equip the vehicles with the plows in 20 minutes. Then when it snows they will go out and cut down the snow.

It is expected that where there are regular fleets of trucks running back and forth between cities it will be an easy matter to make some progress, whereas last year no attempt was made to do anything except by individual truck owners.

Some of the cities will allot the work to different owners by lot for a week at a time. This may mean that some owners will have much work and others perhaps not so much, but when a big storm comes all will be asked to pitch in and help.

The commission promised to give some attention to erecting snow shields along the highways like the railroads do, for it was pointed out that drifts sometimes block up a road quickly after it has been cleared. With everyone planning to cooperate fully it looks as if Massachusetts would solve the snow prob- this winter.

By spring, taking advantage of what has been learned, Commissioner Cole will make recommendations to the Legislature for such appropriations as may be necessary to do the work on a larger scale when emergencies arise.

Since the meeting referred to above, it appears that the truck owners have lost interest in the matter of furnishing the motive power for the snow plows furnished by the Department of Public Works and Commissioner of Public Works John N. Cole has not placed definitely upon the motor truck owners and operators any blame that may arise if the main highway traffic routes of the state are not cleared of snow this winter. He states that the attitude of the truck owners and operators toward the problem of cooperaing with the Department of Public Works to remove snow is woefully lacking in the final check-up, as compared with what the public had been led to believe would be done when the agitation was on last winter, and even when the conference was held.

"The state appropriated $50,000 for machinery and oversight of snow removal on main through routes," says Commissioner Cole in a statement recently issued. "The money has been partly expended for plows, and the department is making plans to organize forces properly to oversee their operation, all dependent upon a sufficient tender of trucks to operate. Up to the present, not a single through route radiating from Boston to the important centers is properly cared for under this method of cooperation. In only one city of the whole group so seriously concerned last winter have the truck operators been rounded up as they should be.

"There is no snow on the ground at the present moment, but there may be within a week. The responsibility for failure to do the job under the program as outlined will be definitely fixed upon the truck operators unless there is immediate action by the chambers of commerce and other organizations who have assumed the responsibility of getting truck operators interested.

"The department cannot believe that the agreement, which was so defnitely arrived at in framing the legislation a year ago, is so lightly to be thrown aside by those who are responsible for a large part in the development of this new system of transportation over the highways of the commonwealth."

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Crusher Run

As soon as Nathan L. Miller becomes Governor of New York State, Commissioner Greene has announced, he intends to tender his resignation to the new executive, holding that the party in power should have full power to administer the Highway Department.

Commissioner Frederick Stuart Greene has announced that no contracts will be made by his department at any time before Jan. 1, 1921, nor will he make any appointments during that time. No road construction is necessary at this time and Mr. Greene is of the opinion that there will be a big drop in the price of road materials before the first of the coming year.

Negotiations are under way for the transfer of the real estate at Split Rock, near Syracuse, formerly occupied by the Semet-Solvay plant, to the State of New York. It is expected that the property will be turned over to the New York State Highway Department as general headquarters for its motor trucks and other equipment used in that section of the state, and that work will begin in the near future looking toward the use of rock for road purposes. This may mean that a stone crusher will be erected there.

Thos. F. Shaugnessy, Albany, N. Y., has filed a claim against the state for $49,424. His contract was to improve the Whitehall-Dresden Center State Highway in Washington County. Mr. Shaugnessy claims that he was obliged to cease work on his contract on account of the number and character of changes sought by the Highway Commission.

The Lehigh Portland Cement Co., Allentown, Pa., has had plans prepared for new buildings at New Castle, Pa., to cost about $200,000, including equipment. The structure will comprise two two-story buildings 40x72 ft. and 22x22 ft., with a three-story power plant 45x140 ft. This company is an associate member of the New York State Road Builders' Association.

The following contractors were low bidders, and were awarded contracts at the letting which took place on Oct. 29: Road No. 5588B, Ward & Tully, Greene Co., 3.95 mi., $174,091.50; Road No. 1419, S. B. Van Wagenen, Ulster Co., 3.17 mi., $105,700.30; Road No. 1306, John R. Arborio, Westchester Co., 5.72 mi., $44,584.00; Road No. 5652, Belmar Contracting Co., Albany Co., 0.49 mi., $26,352.45; Road No. 5656, Richard Hopkins, Montgomery Co., 3.36 mi., $149,856.00; Road No. 1545, Lane Construction Corp., Oneida Co., 5.38 mi., $160,968.00; Road No. 1546, Lane Construction Corp., Oneida Co., 5.03 mi., $177,724.00; Road No. 5659 Stento & Serafini, Otsego Co., 1.37 mi., $52,329.00; Road No. 1556, James Conley, Seneca Co., 1.69 mi., $47,873.10; Road No.

5661, Lane Construction Corp., Yates Co., 3.12 mi., $108,022.60; Road No. 1471, Forness & Fote, Chautauqua Co. 5.85 mi., $275,074.61; Road No. 5172A, John E. Pidgeon, Erie Co., 0.05 mi., $10,368.00.

The contracts awarded for building 12 state highways comprise a mileage of 39.19 at a cost of $1,332,943.66. It was considered the most successful letting conducted in years, and it is the first new construction authorized by Commissionery Greene since last April, when labor conditions and the cost of materials forced a suspension of new highway construction. There were 41 bids and every one was below the engineer's estimate.

A meeting was held recently by the residents of Downsville, Delaware County, to consider the prospect of building a 13-mi. road from Downsville to East Branch. This road when built will connect the main highway from Binghamton to New York and should be constructed, but this cannot be done unless another bond issue is provided, or the county appropriates the money, as Commissioner Greene is going to adhere to his "pay as you go" policy.

New Hampshire Good Roads Association

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Following the conference held at Washington between Secretary of the Navy Daniels, Governor Milliken of Maine and Governor Bartlett of New Hampshire, the contract for the erection of the interstate bridge connecting the two states at Portsmouth and Kittery Point has been awarded to Holbrook, Cabot & Rollins, of Boston. The bid of the Boston company, $690,000, is for the structure alone and is far in excess of the estimate made by the committee.

The activities of the Dover Street Department ceased on Nov. 8 when all but eight men were discharged. These eight men will have to take care of the new work of the Street Department until the first of the year. This is the result of the refusal of two of the aldermen to agree to appropriate funds for the maintenance of the department. The aldermen claim that sufficient money was appropriated.

Winslow & Cummings, the well known highway contractors, have just completed for the state about 1½ mi. of modified Topeka pavement in the town of Hooksett. A similar job was done earlier in the season in the town of Merrimac. They have also finished a cement concrete bridge in Merrimac.

F. H. Colburn, Assistant State Highway Engineer, and W. F. Purrington, State Highway Chemist, attended a meeting of state highway chemists and construction engineers for the Northeastern Division, comprising the States of Mane, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania and Delaware. The meeting was held at Hartford, Conn., the idea being to decide, if possible, upon some standard specifications which could be used by this group of states. The report of the meeting will be presented at the annual meeting of State Highway Officials in Washington, D. C., in December. Mr. Purrington is chairman of the committee for this group of states.

Due to the fine weather which we have had this fall, the State Highway Department has been able to finish up practically all the construction work that was outlined for the season. Only a few of the federal aid jobs will have to be carried over to spring.

It is probable that the State Highway Department has two records for construction of federal aid projects. One section of gravel road, practically 1 mi. long, was commenced in 1918 and will not be completed this year. Another project, over 6,000 ft. of modified asphalt, was constructed in 19 days.

A most successful meeting of the New Hampshire State Road Patrolmen's Association was held at Keene on Thursday, Oct. 28. The annual business session was held in the Council Chamber at 11:00 a. m. and the following officers were elected for the coming year: Arthur E. Jennings, of Stoddard, President; John W. Edwards, of Temple, Vice President; Bert E. Foster, of Alstead, Secretary; and Herbert E. Fogg, of Keene, Treasurer.

After the business meeting a conference was held on matters relating to highway work. At 1:00 p. m. dinner was served in Widely Hall. About 150 members and invited guests were present.

Mayor W. H. Watson, of Keene, the first speaker, congratulated the association on its meetings. He said that more permanent roads in the future depended on better construction and better maintainance and that he was glad to welcome the meeting to Keene.

State Highway Commissioner Everett recalled that five years ago he was a guest of the association at a similar dinner, and said that he believed this was the only organization of its kind in the state that had kept up its organization and meetings. He referred to the lack of sufficient funds to keep up the maintainance work as it must be kept up if the improved roads were not to be allowed to go to pieces under the greatly increased traffic and said it was a most important problem for the people and their representatives in the Legislature to work out. He also pointed out that the motor vehicle fees have been depended upon largely to meet road maintainance costs, and that they have increased perhaps 20% a year, while the roads under state patrol have increased 100 mi. a year, labor costs have increased 100% and materials costs 200 to 300%. It is for the Legislature to decide whether to provide sufficient money to maintain the roads already improved or let them go to pieces, thus losing practically all that has been put into them, he held.

Commissioner Bates of Vermont spoke interestingly of his work in that state. He said that while he had great respect for road engineers, who are essential, yet when one finds a good road he should not forget the patrolman who maintains it. In this connection, he pointed out that the few weeks to come comprise the time when the patrolman's work, if properly done, will count for more next year than that done at any other time.

Commissioner Chase, of the Motor Vehicle Department, congratulated the local association on its success as an organization and on the roads the members maintain. He held that it was not consistent for the Legislature to build gravel roads under present traffic conditions and that the right method of taxing trucks had not yet been found.

Former Mayor Holmes of Worcester spoke appreciatively of his welcome by the local association and of his interest in New Hampshire patrolmen.

Robert Marsh, Superintendent of Streets of Springfield, praised the efficiency of the New Hampshire patrolmen and spoke of some of the difficulties all road builders are up against.

Commissioner Blake, of Worcester, discussed briefly some road problems and, as president of the Massachusetts Highway Association, invited all interested to attend a meeting at the American House, Boston, Nov. 18, to discuss snow removal.

Engineer Colburn, of Concord, predicted that unless New Hampshire raised more money for roads several hundred miles of improved roads would have to be abandoned by the state and all its funds devoted to building and maintaining trunk or main lines. These must be built to carry the heavy traffic of today, he held, and adequate funds must be provided for their maintainance. He also gave figures of interest regarding the weights that trucks are carrying, some of which are most unreasonable and destructive to roads.

PERSONAL MENTION

E. S. Winslow has been appointeed general sales manager of the Canadian Ingersoll-Rand Co.

L. Noland has been appointed engineer of Foard County, Texas, with headquarters at Crowell.

J. W. Lindsay has been appointed superintendent of roads for Malahide Township, Ont., Canada.

Forest Lake, of Sanford, Fla., has been appointed a member of the Florida State Road Department.

O. T. Hess has been appointed managing engineer of the Kent County, Michigan, Road Commission.

G. R. Southee has been appointed assistant general sales manager of the Canadian Ingersoll-Rand Co.

C. C. Boyer has been appointed district engineer, with headquarters at Las Vegas, by the Nevada State Highway Department.

Manley Osgood, who was formerly city engineer of Ann Arbor, Mich., has been appointed manager of the Ann Arbor Asphalt Co.

L. L. Theriault has resigned as town manager of Edmundston, N. B., Canada, to resume his former position as division engineer of the New Brunswick Department of Public Works.

A .E. Foreman has resigned as chief engineer of the British Columbia Department of Public Works to enter business. Mr. Foreman is president of the Canadian Good Roads Association.

———ooo———

Granada, Spain, is using the walls of ancient structures as a source of stone for road building.

Road Construction in Oregon has been seriously hampered by snow and rain during the past few weeks.

Road Work in Arizona has been hampered by recent snows and rains, according to a report of the U. S. Weather Bureau.

Students at La Plata, Md., on Saturday, Oct. 29, repaired the road leading from Oak Ave., to the public school. Gravel was taken from a pit on the school property.

West Virginia Celebrated Oct. 15 as Good Roads Day, in accordance with a proclamation of Governor John J. Cornwell. Exercises were held in the schools of the state.

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JAMESTOWN, N. Y., DECEMBER 1, 1920

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22

Liberty Highway Tunnels of Allegheny County, Pennsylvania

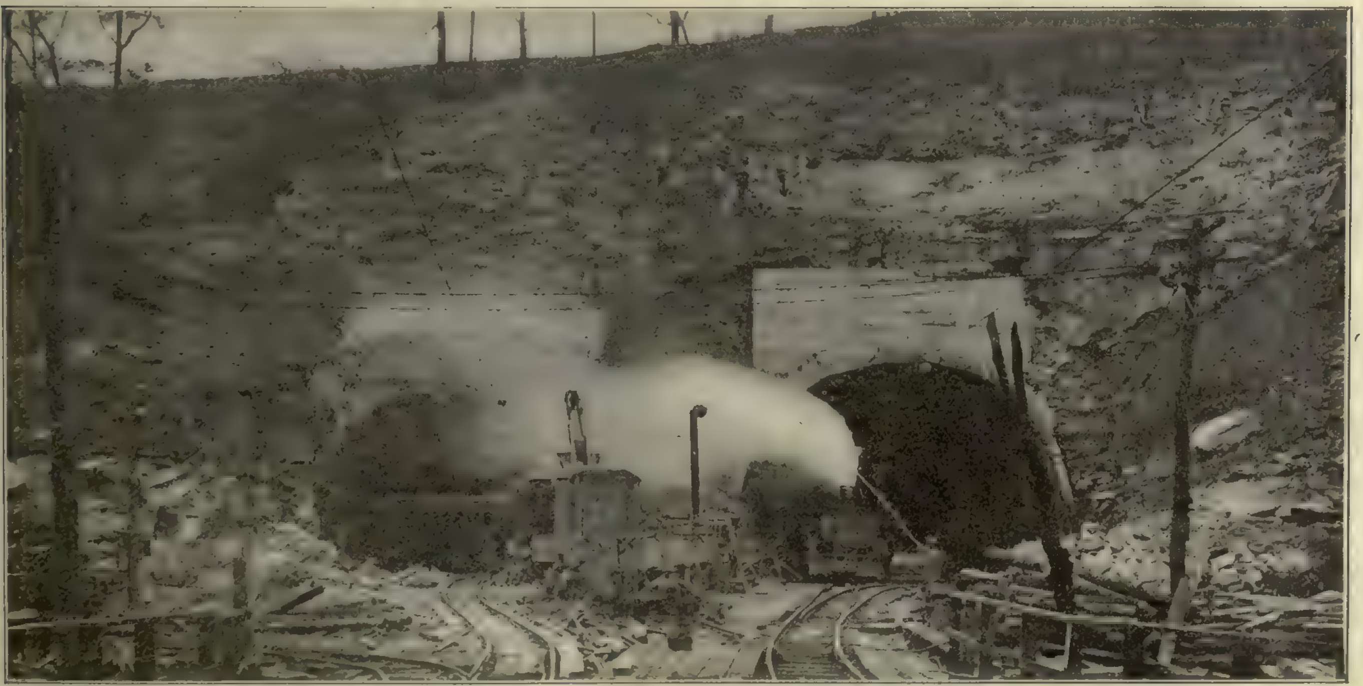
Longest Highway Tunnels in World are now Being Built in City of Pittsburgh and Will Furnish Easy Access to Residential Sections

The County of Allegheny, Pennsylvania, is constructing two parallel highway tunnels through the South Hills, at Pittsburgh, which will be the largest highway tunnels in the world. From portal to portal the length of these tunnels will be 5,715 ft., or a little over one mile. The roadway will be 21 ft. wide and a footway 4 ft. wide will be provided for pedestrians. The highest point of the arch will be 13 ft. 3 in. above the crown of the roadway.

These tunnels will form the connecting link between Washington and Brownsville Avenues, facilitating access to the suburbs of Beechview, West Liberty, Dormont and surrounding territory. Accordingly, it is expected that little commercial or industrial motor traffic will be developed in these tunnels. Two lines of traffic are provided for in each tunnel.

The ledge of rock through which the tunnels pass consists of shale topped with sandstone that has been quarried for local building construction. The tunnel follows the line of the rock strata, having a grade of .39%. The higher part of the ledge is drained by abandoned coal mines. The tunnels will be provided with drains and the walls will be waterproofed several hundred feet at the portals and wherever else deemed advisable.

The tunnels are of horseshoe shape and are being lined with 2-ft .concrete, reinforced at the intrados so as to prevent cracking. The filling back of the concrete lining is required to be cemented into



PORTALS OF LIBERTY HIGHWAY TUNNELS NOW UNDER CONSTRUCTION AT PITTSBURGH, PA.

a solid mass by grout which is forced through pipes placed in the lining. The distance from center to center of the shafts is 59 ft., with about 27 ft. of solid rock between.

One of the most important problems in the construction of these highway tunnels is that of ventilation. In order to secure data on the effect of motor vehicle exhaust vapors on human beings, the U. S. Bureau of Mines has conducted a number of experiments, the results of which were utilized in making ventilation calculatons. The maximum traffic in a tunnel is computed to be 114 motor vehicles, from which it was calculated that a maximum of 280,000 cu. ft. of air per minute would be required for ventilation.

The system of Saccardo used in the ventilation of Italian tunnels, with some modifications, has been selected for ventilating the shafts. Air will be blown in at one end of the tunnel and will travel in the direction of the traffic, which will aid in the propulsion of the air. Details of the ventilation system are now being worked out, the Bureau of Mines having not yet completed its investigations.

It was originally planned to construct one wide tunnel accommodating four lines of traffic, but it was concluded that the construction of two smaller tunnels was more feasible.

The accompanying photograph, which was taken a few weeks ago, shows the work being done at one end of the tunnels.

——000——

Width of Roadways for Different Classes of Streets*

By ROBERT HOFFMAN†

The determination of roadway widths is not a matter susceptible of exact scientific treatment because it involves several indeterminate factors. The subject has been widely discussed and there is not much that is new, but a review of the situation, especially as it is affected by motor-driven vehicles, is doubtless warranted. Moreover, there seems to exist a demand for standardization or classification, so that, certain conditions being assumed, the width can be determined directly. This would permit economical construction both by saving the cost of unnecessarily wide roadways and by doing away with the necessity for untimely reconstruction of roadways of inadequate width. Roadways that appear altogether too wide for the traffic using them are of frequent occurrence and apparently represent an unnecessary and idle investment. Roadways too narrow for the traffic they carry are also of frequent occurrence, especially where there are street railways tracks. Either condition may be the result of some arbitrary rule, while the latter may be due to underestimating the growth of traffic or the unexpected construction of street railway tracks after the street was built. Correcting too narrow roadways involves reconstruction or widening that is generally expensive and is also an annoyance to traffic. Foresight in judging traffic conditions and the adoption of logical standards seem quite necessary to prevent unsatisfactory conditions.

The determination of widths may be considered from two points of view—one that of appearance and the other that of traffic accommodation.

The first viewpoint is chiefly applicable to parkways, boulevards and certain classes of residence streets, where appearances largely control the design. Making the roadway from 50 to 60% of the distance between property lines will be satisfactory in many cases, but the design of planting strips and lawns nearly always will control the width and arrangement of the paved portions. Even in such cases expected traffic should be considered, but it may be subordinated to other conditions.

The consideration of the width from the second viewpoint, that of traffic accommodation, obviously applies to the majority of cases and should prevail when considering any basis of design or standardization of widths.

To justify the importance of width, it is only necessary to consider the financial aspects. If present road building programs are carried out, it does not seem impossible that for some time to come 10,000 mi. of pavement will be constructed annually. An extra foot of width involves from $2,000 to $3,000 per mile of pavement A foot of width over the country's entire road program, therefore, would involve from $20,000,000 to $30,000,000 annually.

Not only is the unproductive investment in excessive width to be deprecated, but the unnecessary removal of labor and material from useful application elsewhere is even more to be regretted. On the other hand, too narrow roadways may slow down traffic, cause accidents and bring about a general curtailment of the usefulness of the road, thus resulting in damage and monetary loss that may be somewhat intangible but that may far offset an apparent economy in initial investment.

The amount and character of traffic bear an important relation to width. The total tonnage or individual vehicle weights are of comparatively little importance, the controlling factors being the size of the vehicles, speeds and the lateral space that must be provided for passing vehicles.

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*Abstract of a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Commissioner and Engineer, Department of Public Service, Division of Engineering and Construction, Cleveland, O.

A passenger vehicle may be assumed to have a maximum over-all width of 6 ft., while the truck normally used does not exceed 8 ft. in width. There seems to be a natural tendency, however, to increase the width of trucks, though so far the maximum width of 8 ft. seems to satisfy existing conditions. The speed of vehicles when meeting or passing affects the clearance that should be provided. Fast moving vehicles obviously require greater clearances than slow ones, so that greater clearances should be provided for passenger cars than for trucks. A space of 10 ft. for each line of moving vehicles seems adequate for all cases, providing the maximum width of trucks does not exceed 8 ft. Though this width is greater than was formerly assumed it seems justifiable in the interest of safety. Many country highways carrying two lines of vehicles are less than 20 ft. in width and have served their purpose admirably, but as traffic has increased, especially in the number of trucks, it has been found necessary in many cases to widen the paved roadways in the interests of safety and the expedition of traffic.

The length of the vehicle is a less important factor, except when space must be provided for vehicles to back up to the curb to load or unload. Many trucks are 25 ft. long and under such circumstances the length becomes the determining factor.

The kind of load carried may also influence width, as loads are sometimes built up to extend over the sides or the back of the vehicle. The frequency with which these cases occur must be considered, as they may form a determining factor.

If a roadway were to be restricted to one line of vehicles the 10-ft. unit could be somewhat reduced. The necessary width in such case would be only enough to accommodate the tread, with a sufficient allowance for irregularities in driving; probably 8 ft. would be sufficient. Cases of this kind seldom occur on public highways, however, and so narrow a roadway would not be justified unless the earth shoulders were usable under normal conditions.

On light traffic roads where the utmost economy must be practiced a single-track roadway may be justifiable, but generally it will be found that the minimum paved width must be sufficient for two lines of vehicles and preferably should be 20 ft. This may be somewhat modifiied and the width reduced to as little as 16 ft., when the natural soil conditions permit driving off the pavement.

For average traffic conditions a 10-ft. space for each line of moving vehicles is suggested as a unit of design. This width applies to street railway cars as well as other motor vehicles. Similarly, 7½ ft. may be assumed as the space required for a row of vehicles parked parallel with the road.

In fixing widths upon the foregoing basis, the problem lies in assuming the probable number of lines of moving and standing vehicles for which provision must be made, and considerable judgment will be required in making such an assumption.

The growth of traffic must be considered, but no exact data can be obtained. It is well known that the improvement of a road brings to it a greater number of vehicles than used it before. It will generally be found, also, that new buildings will be put up along an improved roadway, thus bringing further additions in traffic. There will also be many occasions for allowing vehicles to stand along the roadside, and this may make necessary additional width.

In a general way, the following classifications may be suggested in accordance with the foregoing discussion.

(A) City Streets Having Double Street Car Tracks

1. Roadway 75 or 80 ft. in width. A roadway of such width will accommodate on each half, one line of street cars, two lines of moving traffic and one line of standing vehicles; or one line of street cars and three lines of moving traffic. In the latter case the 80-ft. width is preferable. The distance between property lines should be from 106 to 120 ft.

2. Roadway 55 or 60 ft. in width. A roadway of such width will accommodate on each half, one line of street cars, one line of moving traffic, and one line of standing vehicles, or one line of street cars and two lines of moving traffic. In the latter case the 60-ft. width is preferable. The distance between property lines should be from 80 to 100 ft.

3. Roadway 40 ft. in width. A roadway of such width will accommodate on each half one line of street cars and one line of either moving traffic or standing vehicles. The distance between property lines should be at least 60 ft.

(B) City Streets Having No Street Car Tracks

1. Roadway 40, 55 or 60 ft. in width. Same conditions as for streets having street cars tracks except that line of street cars is replaced by line of moving vehicles. Absence of street car tracks will frequently permit traffic going in one direction to occupy more than half the roadway. This would be possible when traffic is periodically greater in one direction than the other.

2. Roadway 20 to 35 ft. in width. Residence streets. A roadway of such width will accommodate two to four lines of traffic under different combinations of moving and standing vehicles. The distance between property lines should be 40 to 60 ft.

(C) Highways Outside of Cities

1. Roadway 40 or 55 ft. in width. For traffic between important centers of population. A roadway of such width will accommodate four to six lines of traffic under different ombinations of moving and standing vehicles.

2. Roadway 30 to 40 ft. in width. For traffic between centers of population of less importance than the foregoing. A roadway of such width will accommodate three or four lines of traffic under different combinations of moving and standing vehicles.

3. Roadway 20 to 30 ft. in width. For traffic between cities and smaller places or between important smaller cities. A roadway of such width will accommodate two or three lines of traffic under different combinations of moving and standing vehicles.

4. Roadway 16 to 20 ft. in width. Rural highways. A roadway of such width will accommodate two lines of traffic.

5. Roadways 8 to 10 ft. in width. Light country traffic where earth at side can be used to a limited extent.

(D) Streets in Small Towns and Villages

1. Same classification as in cities, except that additional width may be required for standing vehicles where business is concentrated on few streets, so as to permit parking perpendicular or at an angle to the curb; 20 to 25 ft. for each row of standing vehicles will be desirable in this case.

The preceding classifications, of course, must be considered somewhat elastic and must be changed if cars are allowed to park otherwise than parallel with the curb. The parking of cars on public streets has an important bearing on roadway widths, but cannot be discussed here, except to note that parking regulations must be taken into consideration in determining widths.

In conclusion it may be said that roadway widths depend upon the size of vehicles, speeds, the clearances that should be provided, and the total number of vehicles expected to use the road at a time, together with their arrangement in lines or rows. Under average traffic conditions, a width of 10 ft. may be assumed for each line of moving vehicles, including street cars, and 7½ ft. for each line of vehicles parked parallel with the road.

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Recent Experiences with Wood Block Pavements*

By Hermann Von Schrenk†

During the past two years numerous failures of one kind or another have been experienced with wood block pavements. After the heavy rainfalls in the summer of 1919 and at various times during 1920 wood blocks have buckled and heaved and in some instances have floated away entirely. There has also been an increase in failures by decay of supposedly well treated blocks. Cases of excessive bleeding have also been reported, but less frequently than in former years. In addition, there has been reported a case of blocks shrinking to such an extent that they became loose.

In view of these defects, especially in connection with the difficulty of obtaining both proper timber and proper creosote oil for treatment, it is perhaps not surprising that wood block paving has dropped somewhat in the estimation of some engineers.

So far as the writer has been able to determine, these failures have not been due to inherent defects in creosoted wood blocks, but almost wholly to conditions entirely within the engineer's control. Many valuable lessons have resulted from these failures, and in the following paragraphs an attempt will be made to give a brief analysis of the underlying causes and some suggestions for their prevention.

Any consideration of wood block pavements may be grouped under five heads: (1) Kind of timber; (2) Condition of timber; (3) Preservative; (4) Treatment; (5) Laying.

Timber.—Where the present A. S. M. I. specifications have been followed, reasonably dense, satisfactory blocks have been obtained, and few, if any, failures, due to the character of the wood have been reported. In view of the failure of the sap wood of treated blocks, numerous inquiries have been received as to whether the sap wood is not to be treated as a serious defect in the block. If sound, sap wood has all the strength qualities of heart wood, the difficulty with sap wood being in the nature of the treatment.

Preservative—While not always in accordance with the A. S. M. I. specifications, the preservatives used in the past few years have been more or less satisfactory and there has been very little complaint. The statement made by the writer before this organization in 1915 that the preservative is not the most important and vital part in successful wood block paving holds today as well as it did then. When a good coal tar product with a fairly high percentage of high boiling compounds is used, failures will be few and far between. In fact, the writer has yet to see failures due to the oil used when the oil was a pure coal tar compound.

Treatment.—The present specifications for treatment have proven satisfactory in every way, and there seems to be no reason for ascribing any of the recent failures to treatment.

Condition of Timber.—The present specifications provide that "The timber may be either air-seasoned or green, but should preferably be treated within three months from the time it is sawed." Recent experiences indicatte that it may perhaps be desirable to modify this clause by greater emphasis upon the necessity for having the timber as thoroughly air-seasoned as possible, in other words, with a minimum moisture content. In 1915 the writer discussed failures due to decay of the sap wood of treated blocks and showed that the decay was due almost entirely to failures to obtain proper sap penetration. Sap decay of creosoted blocks has become more evident and attention is again called to the necessity of obtaining thorough penetration, meaning at least perfect penetration of every part of the sap wood. This can be obtained only if the blocks are as dry as possible, many failures to obtain complete sap penetration being due to the fact that the blocks

(Continued on page 262)

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*Abstract of a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Von Schrenk & Kammerer, Consulting Timber Engineers, St. Louis, Mo.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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FUNCTIONAL AND GEOGRAPHICAL DIVISION IN HIGHWAY ORGANIZATIONS

The methods of dividing the administration of highway work in state departments have been discussed at some length in highway engineering literature. Taken all together, these writings indicate a considerable difference of opinion as to whether the first division of duties and powers should be made along functional or geographical lines.

As a rule, both methods of division are almost certain to be required somewhere in the organization. In the general case the first division might be made either way. Except in organizations handling work in very small areas, or, perhaps, in those taking care of very small amounts of work in large areas, there will be almost inevitably a cleavage along geographical lines. And division by functions is almost necessary in an organization handling highway construction, repair and maintenance.

When an individual case is considered, there may well be a difference of opinion as to how the first division should be made. In one state or county functional division may be the better plan, while in another, geographical division may be more advantageous. Each plan has succeeded, and each has failed, in actual practice.

An example of the possibility of an honest difference of opinion on the question is furnished by New York State. At present the first division of duties and responsibilities is along functional lines, one deputy commissioner having charge of construction and one of maintenance. Some years ago, however, a board of consultants recommended a plan of organization in which the division was geographical.

Each case will present certain special features that will condition the solution and each case, as a rule, will have to be considered as a separate, individual problem. The method of division, too, will seldom be strictly geographical or strictly functional but a combination of the two in which one or the other predominates.

THE MOTOR TRUCK IN INDUSTRY

Modern industry's dependence upon the motor truck probably is not fully appreciated except by those directly concerned. Even by them, it is hardly realized, perhaps, beyond the limits of their own particular business.

Many examples of the utilization of the truck have been noted in this journal. Two more are given elsewhere in this issue under the caption "Motor Trucks Aid Many Industries."

According to a statement noted therein, industry "has outgrown the whole system of rail transportation." Even if that statement is too broad, it is certain that the railroads are no longer adequate for all the needs of industry. During the past few years, this lack has been made up by the truck. Present indications are that in the future the truck will find ever increasing use in indusries of all kinds.

PITTSBURGH'S TUNNELS

The bref account of the Liberty Highway Tunnels at Pittsburgh, printed elsewhere in this issue, is of particular interest as an illustration of the difficulties of city planning and street design in that city and others of like topography.

These difficulties are not common—do not have to be overcome in the average American city. The difference in elevation between the lowest and highest points in the city is between 650 and 700 ft. and a large part of the area is cut into by deep ravines between rugged hills. Its area is large, but a very considerable portion of it is unsuited to development. Besides its hills, Pittsburgh has large and small rivers and a much restricted "downtown" business district.

The methods being employed to overcome its natural disadvantages (from a utilitarian city planning point of view) are both interesting and instructive. The necessity for adopting some of the expedients to which recourse has been had are examples of the desirability of planning for the future in the early days of a city's development.

Recent Experiences with Wood Block Pavements

(Continued from page 260)

were not thoroughly dry and that water pockets were present in the sap wood. It is useless to lay a block pavement if there can not be reasonable certainty that it will be so protected against decay as to give the maximum length of life. No amount of steam treatment will give uniform distribution of creosote oil in wet wood, and in this connection it may be of interest to explain that the initial steam treatment of blocks is not so much to get rid of the water, as to assist in driving out the air which is the principal cause of bleeding after the blocks are laid. Even if the use of thoroughly air-seasoned material were not warranted for other reasons, it would be necessary to treat air-dry timber for the purpose of obtaining better penetration.

Inspection.—The present specifications of the A. S. M. I. call for careful inspection after treatment by sawing a number of blocks at right angles to the fibers through the center. This is practically the only way to detect the extent of the penetration, and in view of sap failures it is strongly urged that this method be followed.

Laying.—By far the largest number of recent failures of wood block paving has been due to the manner of laying. In the early days of this work, when more or less rough concrete foundations were used, the sand-cement cushion was adopted largely to provide a smooth base. During its more extensive use, difficulties of all sorts arose. The blocks bulged after rainfalls, and after very heavy rains whole street sections floated away; curbstones were thrown out of line and the shifting of the sand base formed irregular depressions, and frequently holes. It has long been realized that the sand cushion was largely responsible for the swelling and displacement of curbstones and surfaces. Water found its way between the blocks and was absorbed in the sand, causing the blocks to swell more at the bottom than at the top. This unequal swelling probably has been the greatest factor in failures during the past few years. These local eruptions have become so common that by some they are considered a necessary evil. In spite of long experience, it is surprising how many cities still use the sand cushion, especially in view of the excellent results obtained by other methods.

As a result of experiences with sand cushions, the practice of laying blocks on a concrete base with a thin cushion of sand-cement mortar or on a perfectly smooth concrete base with a bituminous coating, was adopted. The first work of this kind was done on Dearborn St., Chicago, in 1914. The easterly half of the street was laid on a mortar cushion and the westerly side on a concrete base with a bituminous coating. According to Engineer of Streets Gabelman, "At the present time the west side of Dearborn St., from Adams St., to Jackson Boulevard, is in excellent condition with the exception of a couple of cup holes. Two yards of maintenance would make it perfect. This side of the street is where the heavy trucks unload mail and should show much more wear than the east side of the street. The east side shows much more wear and is very uneven and is full of depressions."

A portion of 15th St. in St. Louis was paved the next year. A concrete base with a smooth finish was laid and painted with pitch and the blocks were laid on the pitch after it had cooled. It was then rolled with a light roller and the joints filled with pitch. This pavement is still in perfect condition. Very few pavements of this sort were laid, however, until comparatively recently, the abandonment of the sand cushion being followed most frequently by the use of a sand-cement cushion laid dry and moistened just before the blocks were laid. In many cases this has not come up to expectations. If the sand was at all moist at the time of laying a very poor bond was formed and the mixture acted practically like a sand cushion.

Another series of problems of an entirely new character came with the introduction of the smooth concrete base with a bituminous coating. In laying blocks on a sand or a sand-cement cushion, a filler of some sort was always specified to guard against admission of water between the blocks. Experience has shown, however, that even with the best care sufficient space was always left to allow the water to percolate to the base of the blocks where it would stand for a short time and then gradually be absorbed by the base of the blocks causing them to swell. In some cases also, the filler when softened, flowed down under the blocks in an irregular way and increased the chances for the admission of water during rains or during sprinkling. The use of a bituminous coating on a smooth concrete base, particularly if the blocks were rolled, provided an almost water-tight condition at the bottom of the blocks. With this construction, explosions after rain storms happened very rarely, if at all. The blocks were more or less protected from water on all sides, except the top, and the amount absorbed from the top was very slight and disappeared rapidly by evaporation, so that there was practically no tendency for the blocks to swell. On the other hand, it was found in some instances that blocks thus protected, lost water during periods of high temperature and tended to become loose. On a street paved in this way, the blocks contracted and became so loose shortly after laying that they had to be taken out, cleaned and relaid. On another street the blocks were laid very tight in anticipation of shrinkage, and in June of this year they began to shrink, as they had on the street previously referred to. This shrinkage, which amounted in one case to 1.3 ft. to 125 ft., was taken up by means of a very ingenious device. Afterwards, with very heavy rainfalls early in September, there was not the slightest movement of the pavement in any direction, an almost ideal condition has been obtained, in that the blocks are protected from water at the base by the pitch coating, on all sides by the pitch filler, and, while the tops are not quite as effectively water-proof, they absorb only a small quantity of water, which rapidly disappears after the sun comes out.

The great trouble with wood block pavements, aside from bleeding, has been water—water absorption and water loss. Water absorption causes expansion, which, when uneven, brings about upheaval and the entire destruction of the street. Evaporation causes loose blocks and a constantly disturbed street surface. The ideal condition is one in which the blocks are so prepared that they contain a minimum amount of water to start with and are so protected that they have little opportunity for absorbing water. The nearest approach to such condition will undoubtedly be obtained by treating as thoroughly air-dry timber as can be obtained, then laying blocks on a smooth concrete foundation with a proper pitch surface, taking care to lay the blocks as tightly as possible, and then using a thoroughly acceptable pitch filler. This practice is now being followed in some of the newer work in St. Louis.

Summing up the foregoing, the experiences of the past few years seem clearly to indicate that the proper procedure for obtaining maximum service from wood block pavements is to follow the A. S. M. I. specifications for timber, preservative and treatment, with a possible modification of the treatment specification looking toward the treatment of thoroughly air-dry timber. This should be followed by blocks laid as tightly as possible on a thoroughly smooth concrete base with a good pitch coating and filled with a good pitch filler.

Illinois Public Utilities Commission Rules Against Bus Line Competition

A recent action of the Public Utilities Commission of Illinois in denying a certfcate of necessity and convenience to a motor bus company is of interest in that it shows the probable policy of public service commissions in connection with the development of highway transportation. The White Star Bus Co. was denied the privilege of operating between West Frankfort and Franklin Heights, in Franklin County, because the Southern Illinois Bus Line is operating in this territory and is giving satisfactory service.

The Whte Star Bus Co. was ordered to withdraw its equipment and cease operation. The Southern Illinois Bus Line, so long as it supplied sufficient and satisfactory service, would continue to have a monopoly, according to T. E. Dempsey, of the Public Utilities Commission. This policy, it is announced, wll be followed in dealing wth all motor transport companies and in accordance with the policy pursued with other public utilities.

Interstate Bridge Planned Between Texas and Louisiana

The commissioners of Orange County, Texas, have authorized the Westcott Engineering Co. to prepare plans and specifications for the construction of an interstate bridge over the Sabine River between Texas and Louisiana. The estimated cost of the proposed structure is $250,000 to $300,000.

Mail Truck Drivers in Maryland Not Required to Take Out Licenses

The United States Supreme Court has decreed that mail truck drivers operating on the roads of Maryland are not required to take out drivers' licenses. The case was a test one, the point at issue being whether the State of Maryland had a right to require drivers of government owned motor vehicles ot obtain state drivers' licenses.

Madison County, Missouri, Has Extensive Road Program

Upon the completion of present road contracts, Madison County, Missouri, will have 101 mi. of hard-surfaced highways, according to a statement by W. E. Howden, County Superintendent of Highways. These roads connect 20 cities and villages. In addition to the paving work, two concrete bridges are being built, one 250 ft. and the other 500 ft. long.

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The City of Corning, N. Y., recently voted $79,000 for street paving.

Marion County, Indiana, has increased the interest rate on $300,000 bridge bonds from 5 to 5½%. These bonds will be used in paying for the construction of a bridge across the White River.

Black Hawk County, Iowa, has started action against citizens of the county to compel the payment of pledges made for the construction of pavement on the Rainbow Trail. The total sum subscribed amounts to $23,000.

The Automobile Club of Southern California has passed a resolution favoring a road to the Imperial Valley, passing through Blackburn Canyon to Bapiste, thence to the state highway west of the Salton Sea. This will cut off the distance from Los Angeles to Brawley by 62 mi.

HIGHWAY TRANSPORTATION

Motor Trucks Aid Many Industries

Successful Use in Long and Short Hauls To Keep the Wheels of Progress Turning

Industry in the United States has outgrown the whole system of rail transportation, experts assert. It will be a year, they say, before even the existing equipment can be restored to efficiency and years longer before the expansion of facilities necessary for the rails to "catch up" to the demands of business. Meanwhile, business everywhere, with its customary resourcefulness, has sought relief elsewhere. Cut off at the roundhouse, it has turned to a garage. In the motor truck it has found succor.

Inter-city shipping by truck, which under ordinary circumstances is included in the short haul category, was commonplace even before the railroads began to falter under their burden—almost as ordinary as the motorization of hauling and delivery within the city. When the already over-worked railroads were hit by the switchmen's strike, shipping for a time received what amounted to a near knock-out blow.

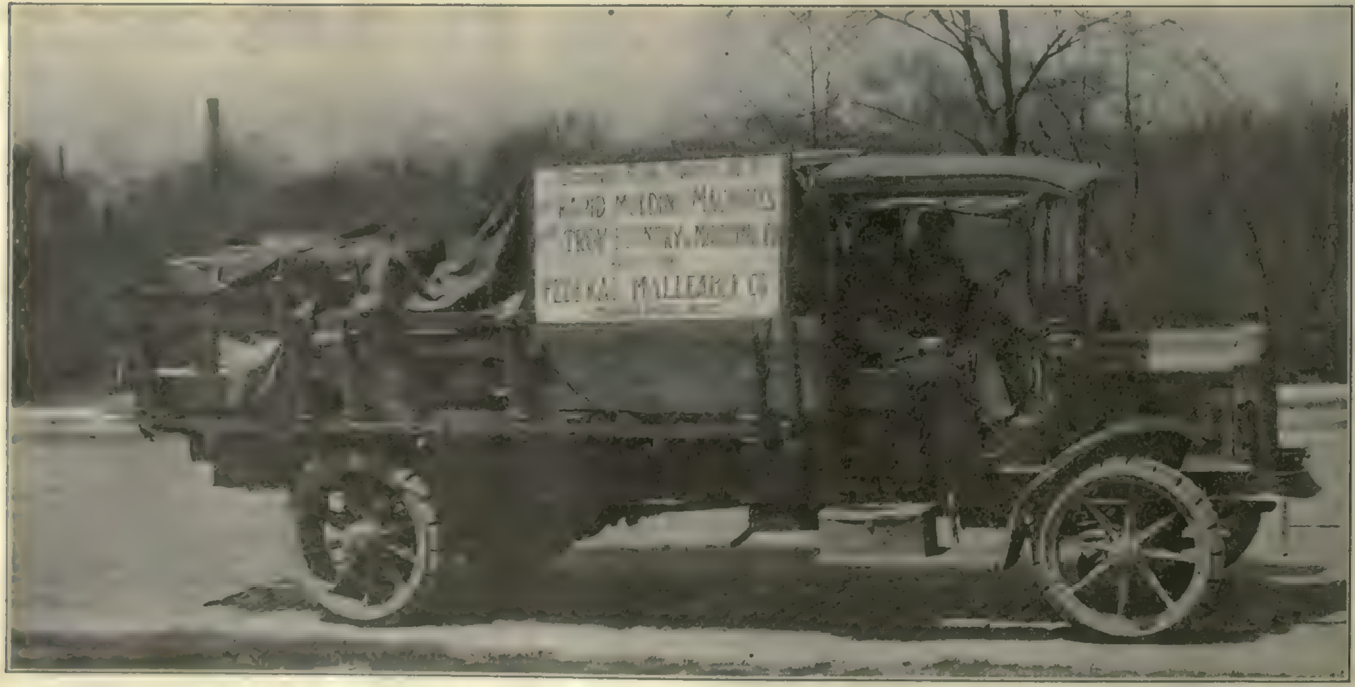
It was here that the motor truck stepped in, not only in a legitimate way on short hauls, but, as the demand grew, on hauls that grew longer and longer, until the 1,000 mi. mark had been passed in numerous instances. Now, the experienced truck maker knows that under ordinary conditions there is no economy in truck hauls of such distances. Hence he would not recommend them except in cases of great urgency.

However, many an emergency did arise which sent motor trucks over the roads on long trips. True, the cost of these ventures was high, but shipper and consignee alike considered the expenditure an ultimate economy after estimating the financial loss through delayed shipments and loss of business that would have been entailed by waiting for shipment by rail. Weighing conditions and consequences, they considered emergency long hauls by motor caravans justified, but only emergency long hauls.

Trucks Save Loss by Knitting Mill

In order to keep its factory running, the Bradley Knitting Mill, Delavan, Wis., had to have yarn, freight embargoes notwithstanding, from the Attleboro, Mass., plant of R. Wolfenden & Sons, commission dyers and bleachers. A White 5-ton truck was called into service. With a cargo of worsted yarns valued at nearly $35,000, the truck, operated by the Globe Coal Co., Woonsocket, R. I., set out on a scheduled round trip of 2,300 mi. The contract price for the trip was $2,888.85 or approximately $2.40 per mile one way, $1.20 per mile for the entire route.

Normally, the yarn would have been shipped by freight. But here was an emergency, to be met promptly. Had the truck not been thrown into the breach, curtailment of production at the Bradley Knitting Mill would have been necessitated. The extra expense of shipping the cargo by truck was more than justified, officials felt, by the urgency of their need.



THREE-TON WHITE MOTOR TRUCK WHICH TRAVELED 2,700 MI. TO SECURE MOLDING MACHINES FOR NEW ADDITION TO FACTORY IN TROY, N. Y.

Similar situations, similarly met in other parts of the country, raise the question whether the use of trucks, though involving increased expense, was not an ultimate economy. Suppose delayed shipments of raw material had been allowed to force suspension of production, with a consequent loss of time for employees? Very shortly, lost time and decreased production would have proved more costly than emergency use of trucks for long hauling of needed raw materials.

Less tangible, but none the less real, was the danger of weakened prestige by failure to promptly fill certain orders, a danger that proved to be the closing factor in the decision of certain firms to use trucks on emergency long hauls. Although impossible to compute in dollars and cents, prestige, it was realized, was worth protecting even at some expense.

Needed Machines Hauled Overland

When the Troy Foundry Co., Troy, N. Y., found that the railroad strike was holding up molding machines needed to equip an addition to the plant, officials of the Consolidated Trucking Co. were asked to send one of their trucks to Milwaukee, Wis., to bring back a load of the machines. Delay could not be countenanced, as a large order from an electric company was waiting to be filled. C. H. Watson, who looks after the trucks, selected a 3-ton White for the trip and decided to drive it himself. Full loads were carried both ways. Taking on a 3-ton load of castings consigned to the Wright Cutter Co., of Chicago, Watson made the 1,300-mi. trip in 8 days. Eight hours of additional driving took him to Milwaukee, where he piled on ten of the bulky molding machines and started back east, on the return leg of a trip covering 2,700 mi.

But emergency hauling over long distances, or transporting perishable goods quickly when the demand is urgent, are merely minor phases of truck utility. The point to be kept clearly in mind is that the truck's great worth is in transportation work under normal conditions.

EQUIPMENT—TRADE—MATERIALS

Minnesota Contractor Lays 1094 Feet of Concrete Road in One Day

In the construction of concrete roads where conditions permit its use, the central mixing plant system is often used to advantage. The McCree, Moos & Co., St. Paul, Minn., working on a road contract for 7½ mi. of road running north and south from Big Lake, Minn., recently made a record run using a central mixing plant. In ten hours a total of 1094 lin. ft. of 18-ft. concrete road of average thickness of 7 in. was laid by this contractor. The central mixing plant was located at Big Lake, making the maximum haul 3.75 mi. A Smith tilting 1-yd. mixer was used in the work. A 1:2:4 mix and a full 1-min. mixing time were specified, the mixer being equipped with a batch meter which rang a bell upon the required number of revolutions.

In the handling of materials a simple and efficient plan was worked out. The cement was unloaded directly from the cars into the storehouse, from which a belt conveyor led to a hopper directly over the mixer. The cement was opened and dumped

TRUCK WITH LEE BODY RECEIVING CONCRETE AT CENTRAL PLANT

DUMPING CONCRETE FROM ORDINARY DUMP BODY MOTOR TRUCK on the belt conveyor. Sand, procured from a pit 1.75 mi. away, was transported by 2½-ton end-dump motor trucks and deposited in a trap, from which another belt conveyor elevated the sand to a second hopped over the mixer. The capacity of the sand hopper was 20 cu. yd.

The crushed stone, St. Cloud granite, arrived at the plant in gondolas and was unloaded directly into a third hopper, over the mixer, by a 1-yd. clamshell bucket on an 85-ft. boom. The stone hopper had a capacity of 25 cu. yd., and, when full, the stone was unloaded to a stock pile.

The batch hopper of the mixer was subdivided so as to hold the correct proportion of aggregates, which were fed from the material hopper above.

After the mixer revolved one minute, it tilted and discharged the batch in 8 seconds into a bottom dump hopper arranged so as to permit a motor truck to drive beneath. The hopper's capacity was 2 cu. yd. or two batches. From the mixer the wet concrete was carried by 2½-ton motor trucks equipped with Lee end-dump 2-yd. bodies. By using this type of body considerable time was saved in placing the concrete.

SMITH TILTING MIXER DISCHARGING INTO ORDINARY DUMP BODY TRUCK

The first stretch of road laid on this contract was started 1.5 mi north of the mixing plant, working south. When this section had been completed up to the mixing plant, the work was started 1.5 mi. south of the Town of Big Lake, working north. Then the work was started at the extreme northern part of the contract, thus permitting the trucks to travel 1.5 mi. over the new concrete road. Four trucks were used when paving near the central mixing plant and seven trucks when paving the sections further away from the plant.

The mixer and belt conveyors were second-hand equipment; the mixer having been used on the Calumet Sag Channel at Blue Island and was originally equipped with an electric motor.

Toronto Contractors Form Association

Paving, sidewalk and sewer contractors of Toronto, Canada, recently met and formed a contractors' association. A. W. Goodson was elected chairman and L. C. Reynolds, secretary.

Blaw-Knox Opens Southern Office

The Blaw-Knox Co., Pittsburgh, Pa., has established a new sales district in the South, with headquarters at Birmingham, Ala. Prescott V. Kelley, formerly with the Pittsburgh office, is in charge of the new district office.

Hare's Motors Takes Over Kelly Truck

Hare's Motors, Inc., has announced that the Kelly-Springfield Motor Truck Co., and its plant at Springfield, O., have been taken over and will be operated by Hare's Motors, the operation organization for the Locomobile, Mercer and Simplex Companies.

"The 'Caterpillar' for Transportation"

The first of a series of bulletins bearing the above title has been issued by the Holt Manufacturing Company, Peoria, Ill. In these bulletins will be described the use of "Caterpillar" tractors in hauling materials in various industries. The first bulletin describes the use of "Caterpillar" tractors in building a road in Illinois.

Portland Cement Association Opens Canadian Office

The Portland Cement Association has announced the opening of a Canadian office in the Birks Bldg., Vancouver, B. C., with A. E. Foreman in charge as district engineer. Mr. Foreman was formerly chief engineer of the British Columbia Department of Public Works and is president of the Canadian Good Roads Association.

Resurfacing Worn Brick Pavements With Texaco Asphalt

An illustrated booklet describing the methods of resurfacing worn brick pavements with asphalt has been issued by the Asphalt Sales Department of the Texas Company. The pavement is thoroughly cleaned and all holes and depressions filled with asphaltic concrete binder so as to bring the street to an even contour, upon which is laid a wearing surface of asphaltic concrete or sheet asphalt. Diagrams and photographs depict graphically the methods outlined in the booklet, which may be obtained free upon request to the Texas Company, Asphalt Sales Department, 17 Battery Place, New York City.

Contractor Uses Hydrated Lime to Aid Flowability of Concrete

The Union Paving Company, of Philadelphia, Pa., is now engaged in laying about 150,000 sq. yd. of concrete and reports that by adding hydrated lime, the wet concrete is rendered more plastic and that the initial set is retarded slightly. In the use of a central mixing plant, where the wet concrete is hauled 3 or even 4 mi., an increase in the flowability is greatly to be desired.

Texas Sand, Gravel and Crushed Stone Association

The Texas Sand, Gravel and Crushed Stone Association was recently organized with J. S. Straw of Dallas as president, J. F. Morris of Gainesville, vice president and Rhea Miller of Dallas, secretary.

V. O. Johnson, President of the National Association of Sand and Gravel Producers, was a guest at the organization meeting.

MEETINGS

Calendar of Coming Meetings

Dec. 13-16,—American Association of State Highway Officials,—Sixth annual convention, Washington, D. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

Jan. 25-27.—Associated General Contractors of America.—Annual convention, New Orleans, La. Chicago, Ill.

National Park-to-Park Highway Association

At the annual meeting of the National Park-to-Park Highway Association at Denver, Colo., on Nov. 12, the following officers were elected: President, Finlay L. McFarland, Denver, Colo.; Vice Presidents: C. C. Neslin, Mayor, Salt Lake City; Sylvester L. Weaver, Los Angeles, and L. C. Vabre, Flagstaff, Ariz.; Secretary-Manager, Gus Holmes, Cody, Wyo.; Treasurer, C. F. Chamberlain, Denver.

American Association of State Highway Officials

The sixth annual convention of the American Association of State Highway Officials will be held on Dec. 13, 14, 15 and 16 at the Washington Hotel, Washington, D. C. The program is as follows:

Monday Morning, December 13

Address of Welcome, by Hon. E. T. Meredith, Secretary of Agriculture.

President's Annual Address.

Paper on "Traffic Census," by A. N. Johnson, Director of Research, Maryland State College, College Park, Md. Discussion by A. W. Dean, Chief Engineer, Division of Highways, Boston, Mass., and A. B. Fletcher, Chief Engineer, California State Highway Department.

Monday Afternoon, December 13

Paper on "What Has Been Accomplshed Under Federal Aid," by Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads.

Paper on "Analysis and Preparation of Estimates," by H. J. Kuelling, Construction Engineer, Wisconsin State Highway Department.

Report of the committee on "Use and Care of Federal Equipment." Discussion.

Tuesday Morning, December 14

Paper on "Load Limitations for Primary and Secondary Highways," by C. J. Bennett, State Highway Commissioner of Connecticut. Discussion by Thomas Maddock, State Highway Engineer of Arizona.

Paper on "Researches Leading to the Adequate Design of Road Surfaces for Heavy Motor Trucks," by A. T. Goldbeck, Testing Engineer, U. S. Bureau of Public Roads. Discussion by A. B. Fletcher, Chief Engineer, California State Highway Department, W. D. Uhler, Chief Engineer, Pennsylvania State Highway Department, and Clifford Older, Chief Highway Engineer of Illinois.

Paper on "Study and Treatment of Subgrade and Foundations," by C. M. Upham, Chief Engineer, State Highway Department of Delaware. Discussion by John H. Johnson, Division Engineer, Massachusetts Highway Department, and I. W. Patterson, Chief Engineer, State Board of Public Roads of Rhode Island.

Paper on "Relative Service Value of Different Types of Pavements," by A. R. Hirst, State Highway Engineer of Wisconsin. Discussion by F. S. Greene, State Highway Commissioner of New York.

Report of the committee on "Tests and Investigations."

Tuesday Afternoon, December 14

The local committee will provide automobile transportation to the Arlington Farm of the U. S. Bureau of Public Roads, where highway research is being carried on by the bureau.

Wednesday Morning, December 15

Paper on "Difficulties Experienced by the States in the Matter of Rail Transportation," by S. E.

Bradt, Superintendent of Highways, Illinois. Discussion by G. P. Coleman, State Highway Commissioner of Virginia, and M. W. Watson, State Highway Engineer of Kansas.

Paper on "What May the Highway Departments Expect From the Railroads in 1921 in the Matter of Transportation of Road Building Materials?" by Daniel Willard, President, B. & O. R. R.

Paper on "What Conditions Would Warrant a State in Purchasing and Operating a Portland Cement Plant?" by H. E. Hilts, Assistant Engineer, Pennsylvania State Highway Department. Discussion by R. J. Windrow, State Highway Engineer of Texas.

Paper on "Modification of Contracts to Meet Present Conditions," by W. R. Neel, State Highway Engineer of Georgia. Discussion by F. S. Greene, State Highway Engineer of New York.

Wednesday Afternoon, December 15

Committee meetings and informal group discussions.

Thursday Morning, December 16

Paper on "Organization of a State Highway Maintenance Department," by John N. Mackall, Chief Engineer, Maryland State Roads Commission. Discussion by J. H. Mullen, Chief Engineer, Minnesota State Highway Department, and W. R. Neel, State Highway Engineer of Georgia.

Thursday Afternoon, December 16

Business meeting, with reports of committees and election of officers.

PERSONAL MENTION

S. B. Davis has resigned as county engineer of Wood County, Texas.

J. J. Haasler has resigned as office engineer of Nueces County, Texas.

H. L. Dick has been appointed city engineer of Kingston, Ont., Canada.

J. A. Monahan has been appointed purchasing agent of the Chain Belt Co.

Frank Holbrook has been appointed superintendent of highways of Webster, Mass.

C. E. Stone has been appointed assistant to the vice president of the Chain Belt Co.

E. O. Adee has been appointed resident engineer on federal aid work in Ottawa County, Kansas.

Carl Nyman has resigned as resident engineer of the Utah State Roads Commission to enter private practice.

J. T. Gillespie has resigned his position as engineer of equipment with the Milwaukee, Wis., Highway Commission.

L. C. Wilson, formerly General Sales Manager of the Chain Belt Co., is now secretary of the Federal Malleable Co.

Dorothy Moody has been appointed draftsman in the Highway Bureau of the Philadelphia Department of Public Works.

Julius Adler has been appointed deputy chief of the Division of Highways, Philadelphia, Pa., at a salary of $5,400.

E. M. Arnold has resigned as county engineer of Boone County, Kentucky, and is now assistant division engineer with the Georga State Highway Department.

Clifford F. Messinger has been appointed general sales manager of the Chain Belt Co., Milwaukee, Wis., succeeding L. C. Wilson, who resigned to become secretary of the Federal Malleable Co.

Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, New York City, will retire, having served the city for 34 years. Mr. Lewis was born in Red Hook, N. Y., in 1856 and graduated from the Rensselaer Polytechnic Institute in 1879. He was engaged in railroad work until 1884, when he became leveler in the Brooklyn Department of City Works. Since that time, with the exception of three years, he has been in the service of New York City.

OBITUARY

R. J. Goodbody, formerly Superintendent of Streets of San Francisco, Cal., died on Nov. 20 in that city.

Albert E. Hauck, President of the Hauck Mfg. Co., Brooklyn, N. Y., died in that city on Oct. 30, at the age of 41 years.

L. H. Peabody, Civil Engineer in the Bridge Department of the Rhode Island State Road of Public Roads, died on Nov. 16, at the age of 42 years.

W. T. S. Wood, President of the Board of County Commissioners of Gibson County, Indiana, died on Nov. 20, following a brief illness, of pneumonia.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Concrete Bridges and Culverts
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JAMES J. TOBIN, Field Engineer
31 STATE STREET BOSTON, MASS.

by two sidewalks 6 ft. wide. The middle span of the bridge will be 212 ft., said to be the longest reinforced concrete span yet projected in this country.

The structure was designed and planned by Frank M. Williams, State Engineer of New York. The City of Schenectady will pay $100,000 and Village of Scotia, across the river, $50,000, and the state will bear the remainder of the cost. In awarding contracts for the work, the job has been divided into four parts, each of which covers a different phase of the work and for which separate contracts will be awarded. The first contract, which is now in operation, embraces the construction of approaches and abutments at each end of the structure. The second contract provides for the construction of 23 reinforced concrete piers, to be completed so that the contractor constructing the arches and superstructures will be enabled to commence operations early next spring. By that time the fourth contract, which will provide for the paving and lighting, will be awarded so that as the superstructure is erected, paving can be started without delay. It is expected that the bridge will be opened to traffic in 1922.

The name of this bridge arises from the fact that the word "Schenectady" is a combination of Indian words meaning "The Gateway" and that this point is the only break in the Appalachian Mountain system from Maine to Georgia. Through it was dug the Erie Canal. The New York Central and Lake Shore Railroads also pass through this break in the Atlantic watershed.

The relocation of the bridge is of particular interest in that five right turns are eliminated. Washington Avenue in Schenectady, leading to the present bridge, is but 20 ft. wide between curbs and carries interurban railway tracks, which, in conjunction with the many sharp turns, make a condition of danger and congestion perhaps without parallel on a main trunk state highway. The new route forms a continuation of State St., Schenectady, the old and the new route making an irregular right triangle, of which the new route is the hypotenuse.

Motor traffic over the present structure, which is owned and operated as a toll bridge by the Village of Scotia, amounts to an average of over 1,000 vehicles a day. On some days during the year over 3,000 motor vehicles pass over the structure. An average of 22,000 pedestrians cross the bridge daily.

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Asphalt Block Pavements*

By P. S. THOMPSON†

The advantages of a unit system asphalt pavement were recognized 50 years ago, the first asphalt block made in San Francisco in 1869 being the outcome of the attempt to combine these advantages with those of a smooth, durable surface. While the results were naturally crude, they were of such nature as to justify the hope of effecting a combination of that kind. Continued efforts were made during the next ten years to improve the process and the product. Material progress was made, especially in the manipulation of the mixture, and with the introduction of powerful mechanical presses in 1880, it was seen that success was at hand. Development has been rapid since that time, new and powerful presses being installed repeatedly and better processes adopted. The development has also been influenced and modified by changing traffic conditions on streets and roadways, and by the industrial uses to which asphalt blocks have been put.

The modern asphalt block is a composition of crushed rock, inorganic dust and asphaltic cement, thoroughly mixed by mechanical means at a temperature of 300° F. The mixture is pressed into blocks at this temperature under a pressure of 240 tons, after which the blocks are cooled gradually in a water bath. The blocks are made in the following standard sizes: 4x8x1¼ in., 5x12x2 in., 5x12x2½ in., and 5x12x3 in., the last dimension in each case being the depth.

Previous to 1897, blocks were usually 4x12 in. and 5 in. deep, and were usually laid on a sand and gravel foundation. From 1897 to 1900, blocks were made 4x12x4 in. and were generally laid on a sand cushion resting on a concrete foundation. In 1900 the size was changed to 5x12x3 in. and at about the same time it became common to lay the blocks on a mortar bed instead of a sand cushion. Improved manufacturing methods resulted in 5x12x2 in. blocks in 1908, and later 8x4x1¼ in. blocks. There has been a constant tendency towards the use of thinner blocks until at present the blocks 4 in. deep are obsolete and the 5x12x3-in. blocks, although still made for special uses, comprise less than 10% of the total output. The majority of those now laid are either 5x12x2 in. or 4x8x1¼ in., the latter being extensively used for shop floors, loading platforms and the like.

When concrete foundations are used, asphalt blocks are laid on a ½-in. mortar bed which serves to correct the inequalities in the foundation and to furnish a bed for the blocks. Asphalt blocks also have been laid successfully on old macadam, in which case they rest on a mortar bed laid on the old macadam which has been scarified and rolled to the proper crown. In the South, where conditions are favorable, blocks are laid on the natural sand, header curbs being used on both sides.

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*Abstract of a paper presented at the 26th convention of the American Society for Municipal Improvements, St. Louis, Mo., Oct. 12-15, 1920.

†Sales Manager, Hastings Pavement Co., New York, N. Y.

A recent development of asphalt block construction to which special attention is called is their use in hillside work. This construction was first employed in Dobbs Ferry, New York, in 1916, on a 9% grade. In this construction the concrete foundation and mortar bed are laid in the usual way and the blocks are laid on the bed one row at a time, with ½-in. wooden strips between each two courses. After laying, the strips are removed and the joints filled with 1:1½ cement grout. Before the grout takes its initial set, it is scraped out of the joint by means of a special tool to a depth of about ½ in., which leaves a smooth pavement with recessed joints affording protection against slipping and skidding.

An interesting development of asphalt block constructions is its use for surfacing pier floors. This construction was used on one of the piers of the Bush Terminal Co., in Brooklyn in 1914. The two outer ends of the pier and a strip about 20 ft. wide on each side of the pier are paved with blocks laid on a 1-in. mortar bed resting on the plank decking. On the remainder of the pier the blocks were laid on a ½-in. mortar bed on a concrete foundation. Many other piers have since been paved with asphalt blocks. In one case, in which the blocks were laid on a mortar bed resting on the planking, the vibration under heavy traffic caused the mortar bed to crumble and sift through the joints. Where this happened the blocks were taken up and relaid on a bituminous bed, with entirely satisfactory results.

One of the interesting installations of asphalt block pavement is at the Army Supply Base in South Brooklyn, N. Y., where there are 936,000 sq. ft. of this pavement, most of which consists of the 5x12x2 in. blocks, the remainder being of 8x4x1¼ in. blocks. In this case the blocks are laid on ½ in. of 1:3 mortar resting on reinforced concrete slabs.

A Model Paving Program for a City of Twenty Thousand*

By MAURICE B. GREENOUGH†

Nearly every American city has some paved streets and recognizes the need of surfacing others as the community grows in population, wealth or civic progressiveness. More or less maintenance and repair are required to sustain, at the highest possible level of efficency, the serviceability of streets already paved. When reasonable maintenance and repair no longer suffice to prolong, at a justifiable cost, the service-life of of existing pavements, reconstruction is necessary. We are persuaded, therefore, that a program, model in economic paving principles for all cities, is a plan which provides for: First, the maintenance and partial renewing of pavements already in use; second, the rehabilitation of pavements whose economic service-life has expired; third, the building of such additional miles of paved streets as may be required from time to time.

The federal census of 1920, so far as tabulated, finds about 80 cities in the United States whose inhabitants number from 18,000 to 23,000. The population of the average city within these limits should lie close to 20,000. We sent a questionnaire to the city engineers of all the communities in this group. Twenty-one questionnaires have been returned to us and the average population of these 21 cities is 20,232.

Although, these 21 cities possess 589 mi. of paved streets. Two-thirds of the mileage is surfaced with viitrified brick, water-bound macadam and gravel. The number of miles of all forms of paving used is as follow:

Pavement	Miles	Per cent.
Vitrified brick	202.3	34.3
Water-bound macadam	95.7	16.2
Gravel	93.8	15.9
Concrete	51.9	8.8
Sheet asphalt	45.2	7.7
Bituminous macadam	41.2	7.0
Asphaltic concrete	19.2	3.3
Miscellaneous	39.7	6.8

A Model Paving Program Measured

We recall that the average population of the 21 cities cited is 20,232. The area of the typical city is 4,094 acres. The community has 70.7 mi. of dedicated streets of which 28.2 mi. are paved. The value of the real property is $14,025,000.

The variations are great, however, in the actual values from which the typical averages are derived. A wide range separates extreme, and mean and extreme values, on all points except population. The diverse composition of cities of the same size is strongly emphasized. For example, the minimum real property valuaton is $5,153,000 at Sedalia. The maximum is $26,000,000 at Ann Arbor. Sedalia has the least area also, 1,760 acres. Bristol has the largest with 16,000 acres. Carbondale has the lowest total miles of dedicated streets with 35. Bristol, as might be expected, has the highest, with 150. Sedalia leads in density of population, with 12.4 persons per acre, and has the least per capita real property valuation, $236. Bristol has the minimum population with 1.4 persons per acre. Ann Arbor has the largest per capita real property valuation, $1,300 per person. The typical city has 5 persons per acre and a per capita real property value of $692.

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*Abstract of a paper presented at the annual convention of the City Managers Association, Cincinnati, O., Nov. 15, 16 and 17, 1920.

†Secretary, National Paving Brick Manufacturers' Association.

A casual comparison might lead us to believe, for instance, that because Beloit has three times the real property valuation of Sedalia, it should have three times as many miles of paved streets. As a matter of fact, Sedalia has 32 mi. of paving and Beloit, 35 mi. instead of the 96 mi. the comparison would indicate. This illustration serves no more than to point out the risk of forming unsound conclusions from superfically drawn comparisons.

TABLE SHOWING DATA AND COMPUTATIONS FOR PER CENT. OF PAVED STREETS AND VALUE PER ACRE OF REAL PROPERTY IN 21 CITIES

City	Miles of dedicated streets	Miles of paved streets	Per cent. of streets paved-P	Total real property valuation	Area of city in acres	Average real value per acre-V
Alliance, O.†	74.0	35.0	47.2	$23,289,000	2,899	$8,030
Ann Arbor, Mich.	80.0	67.0	83.6	26,000,000	3,840	6,770
Appleton, Wis.	90.8	14.8	16.2	6,000,000	4,160	1,442
Arlington, Mass.	42.0	20.1	48.0	21,759,675	3,520	6,181
Barberton, O.	66.1	8.9	13.4	22,940,000	3,840	5,972
Beloit, Wis.	81.0	35.0	43.6	16,363,265	3,232	5,062
Biddleford, Me.*	....	44.0	....	10,935,700	....	....
Bristol, Conn.†	150.0	25.5	16.9	18,759,000	16,000	1,171
Carbondale, Pa.	35.0	7.8	22.2	7,764,984	2,227	3,486
Cohoes, N. Y.	35.0	15.1	43.1	8,668,467	3,200	2,709
Danville, Va.	51.5	35.5	68.9	15,601,978	2,208	7,066
Elyria, O.	58.0	35.8	61.6	20,235,000	4,224	4,790
Freeport, Ill.	70.0	41.1	58.6	5,778,895	2,668	2,150
Lafayette, Ind.	91.5	56.4	61.6	18,146,840	2,995	6,059
Oil City, Pa.	48.0	24.1	50.1	12,287,607	2,688	4,571
Olean, N. Y.	49.0	19.7	40.1	10,641,485	3,500	3,040
San Bernardino, Cal.*	75.0	20.0	26.6	....	4,480	....
Sedalia, Mo.	125.0	32.0	25.5	5,152,870	1,760	2,928
Waukegan, Ill.	66.0	18.8	28.4	7,200,000	3,360	2,143
Winona, Minn.	59.4	14.4	24.1	5,876,448	7,360	798
Yakima, Wash.*	70.0	18.0	25.6	....	2,355	....
Average for 18 cities	70.7	28.2	41.6	$14,025,362	4,094	$4,132

*Biddeford, San Bernardino and Yakima are excluded from the averages because of incomplete data.

†Figure for real property value is 75% of total real and personal.

It does not necessarily follow, because one city of 20,000 inhabitants has 40 mi. of paving, that any one of as many as ten others ought to have the same number of miles. We must seek farther for a basis of proper comparison. We shall find one between real property values and the percentage of paved streets. And we shall also find that this proper basis of comparison, at the same time, gives us the measure of what a city of 20,000 population ought to have and do in the way of paving.

Students of paving economics have long known that land abutting a paved street is worth more per unit of area, other things being equal, than land on an unpaved street. The more paved streets a community has, the higher should be the total real property valuation.

Of course the general level of real property values, from which the paving increment is measured, is not necessarily the same for all cities, even those of the same size, for many complex factors of economic and social significance, with no relation to paving, have to do with the determining of values in any community. But admitting a varying level of values in as many cities as may be named, of the same size, we find that there is a fixed relationship, common to all the cities, which gives us a safe index for comparison.

If we compute the percentage of paved streets for each of the cities which constitute the basis of this inquiry and determine the average value per acre of real property for each city, we have the necessary factors. The index we are seeking is found to be represented by the straight line graph whose equation is,

$$P = \frac{V-1{,}000}{75.2}$$

where V equals the average value of real property per acre and P equals the percentage ratio of paved streets to the total mileage of dedicated streets.

The principal uses of this criterion or index are: Any city of 20,000 inhabitants may judge its comparative position with reference to another city of the same size in respect to paving improvements; a means is provided to estimate the amount of new construction, subject to adjustment to fit local conditions, that a city of 20,000 will require in any given period of future time.

The first application of the index is largely of general interest and enables a city to determine whether it is keeping pace in paving progress with other cities in the country of equal rank. The second use of the index is by far the more important. It

(Continued on page 274)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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COMING ROAD LEGISLATION

During the early months of next year the legislatures of a large proportion of the states will meet. Among the new laws enacted and the old ones amended or repealed there will be many relating to roads, road work and traffic regulation. The resulting legislation will comprise some wise measures, a few vicious ones and a flood of laws that, though drawn with the best intentions, will be ill-advised and of little or no benefit.

While highway work is more or less thoroughly organized in most states, it is reasonable to expect a considerable amount of legislation for the financing and administering of road construction and maintenance. The demand for improved roads is as strong as ever—if not, indeed, stronger—and the public is all the while becoming better informed on matters pertaining to roads and traffic. And without question there is ample room for improvement in the existing road laws.

Everyone at all familiar with the present laws of any state realizes how needlessly complex they are, how many contradictory statutes exist and how nearly unintelligible some of them are. The reasons for this condition are plain. Road laws, like other laws, have been enacted from time to time, as their need became apparent. In framing legislation to cover some particular point little or no attention has been paid to existing statutes. Other laws have been enacted as emergency measures without any real study of the questions involved. And there have been enacted countless measures for certain localities and for special interests.

Under the circumstances, many of the state legislatures could render a greater service by revising, simplifying and codifying the laws now on the books than by passing new laws. Some new measures are probably demanded by changed conditions, but the number should be kept down to a minimum—and could be by the proper amendment of present laws.

Highway engineers have a very real duty in connection with law making. They, better than anyone else, know what is needed and how it can be accomplished. Heretofore they have had too little to do with legislation. The time has come for them to assert themselves.

THE NEED OF COMPREHENSIVE COST RECORDS IN HIGHWAY WORK

It should be the aim of every public official or group of officials entrusted with the work of highway construction to spend the available funds in such manner as to assure the maximum possible return in facilities for the transportation of passengers and commodities. Such officials are exactly analogous to executives of a business concern engaged in the production of some ordinary commodity. Similarly, the public corresponds to the stockholders in the business enteprise; the legislative and executive departments of the governmental unit concerned occupy positions quite like the board of directors and the officers; and the roads are the products manufactured.

Modern manufacturing businesses find it necessary to keep more or less elaborate records in order to keep down the cost of production and permit the making of profits, because the returns, measured by the prices they can obtain for their products, are limited by competition, by demand and by other factors. The makers of roads are not in a similar position, for they do not have to keep down production costs to meet competition—except as railways and waterways may be considered as competitors of the highways—and the demand for roads is unlimited. The two cases differ also in that the entire output in the case of the road producing organization is "sold" to the stockholders—again with an exception which is that the roads of a state or a nation are a part of the industrial and commercial enterprises in which the people compete with those of other states or nations.

But these differences do not render it any less necessary to keep complete and detailed costs. On the other hand, they make such records even more necessary. In the first place, there is a greater tendency to waste and extravagance in the road building organization, because of the lack of competition, the unlimited demand and the inherent disregard of how the other man's money is spent, especially when the other man is the public.

The road building organization also needs another set of records that the ordinary business enterprise does not. The manufacturer, for instance, does not have to calculate his returns, for the price of his product is fixed at a certain sum in dollars and cents. The return a road or a system of roads will yield can only be approximated, but some estimate must be made if the work is to be done intelligently, for the return in transportation is the only true measure of a road's value and, therefore, the only gauge of the justifiable expenditure for its improvement.

How many highway departments keep records anything like as complete as those briefly indicated herein? Yet how can the most efficient use of the public's money be expected without them?

A Model Paving Program for a City of Twenty Thousand

(Concluded from page 272)

furnishes a rather definite criterion to guide a city in the fixing of its prospective paving requirements during any coming period of time. Thus by estimatng the probable average value of real property at the end of five years, say, which any city can do with reasonable accuracy, the equation or curve will show the normal percentage of paved streets which the city should possess at the expiration of the period.

To illustrate: Suppose our typical city, which has an average real property value of $4,132 per acre and 41.6% of paved streets, out of a total mileage of 70.7, estimates that its real property will be worth an average of $4,600 an acre at the end of five years. The city should then have 47.8% of its streets paved, or 33.8 mi. It now has 28.2 mi. Therefore, to keep up to the prevailing practice for cities of 20,000, our typical city must build 1.12 mi. of new paving per year for the next five years. Thus by the use of the relation, with due regard to local conditions that may modify the values somewhat, the determination of prospective paving requirements, in terms of totals, is at least partially lifted out of the realms of conjecture.

The following table gives the percentages of paved streets that correspond to each $500 increment in average real property values, according to the relation just derived:

Value	Per cent.	Value	Per cent.
$1,000	0.0	5,000	53.2
1.500	6.6	5,500	59.8
2,000	13.3	6,000	66.5
2,500	19.9	6,500	73.1
3,000	26.6	7,000	79.8
3,500	33.2	7,500	86.4
4,000	39.9	8,000	93.1
4,500	46.5	8,520	99.7
	8,500	100.0	

Who Pays for Street Improvements?

The paving problem cannot be considered without special consideration of the point of view of the taxpayer. To a large extent the cost falls upon the property owner and he pays most of the bill in direct taxes. A brief review of just what the taxpayer's part in street improvements is in the city of 20,000 is pertinent.

City	Cost of new construction borne by abutting property	proportion of reconstruction
Alliance, O.	98% less intersections	50%
Ann Arbor, Mich.	80%	none
Appleton, Wis.	100% less intersections	none
Arlington, Mass.	100%	none
Barberton, O.	98% less intersection	....
Beloit, Wis.	85%	Depends on first cost of paving
Biddeford, Me.	none	none
Bristol, Conn.	33⅓%	none
Carbondale, Pa.	100% less intersections	none
Cohoes, N. Y.	50%	50%
Danville, Va.	none	none
Elyria, O.	66⅔%	50%
Freeport, Ill.	80%	80%
Layfayette, Ind.	100% less intersections	100% less intersections
Oil City, Pa.	100% less intersections	none
Olean, N. Y.	100% less intersections	none
San Bernardino, Cal.	100%	100%
Sedalia, Mo.	100%	100%
Waukegan, Ill.	nearly all	nearly all
Winona, Minn.	100% less intersections	100%
Yakima, Wash.	100%	....

New York Railroads Must Share Expense of Strengthening Bridges

The New York State Public Service Commission has ruled that where increased traffic and weight of vehicles have made an existing highway bridge over a railroad unsafe, the cost of strengthening and reconstruction comes under Section 91 of the Railroad Law, which provides that the railroad shall bear one half of the cost.

Philadelphia Will Tax Bridges and Railroad Sidings

The Law Department and Department of Public Works of Philadelphia, Pa., have drafted an ordinance providing for the taxation of all railroad sidings, bridges, conduits, etc., crossing or encroaching upon the streets of the city.

The measure provides a charge of 70 ct. per square foot per year for bridges, with a minimum charge of $200, and 50 ct. per square foot per year for all ground within the street lines occupied by railroad sidings. There are about 10,000 encroachments of various kinds upon the city's highways.

Permits to maintain encroachments will run for a period of 10 years and no bridge across a street may be more than 20 ft. wide. It is expected that about $500,000 in revenue each year will result from the proposed ordinance.

States and Counties Vote Immense Bond Issues

$1,000,000,000 Federal, State and County Funds Available for Road Work in 1921

State and county bond issues in this country make over $1,000,000,000 available for highway construction and maintenance, of which approximately $550,000,000 probably will be expended during 1921, according to figures compiled by the American Automobile Association.

State bonds for highway improvement aggregating $533,800,000 have been authorized during the past three years. During 1918, state bonds amounting to $60,000,000 were authorized in Illinois and $50,000,000 in Pennsylvania. The following issues were authorized during 1919:

California, $40,000,000; Oregon, $12,500,000; Nevada, $1,000,000; South Dakota, $4,500,000; Wyoming, $2,800,000; Maine, $10,000,000; Michigan, $50,000,000; Utah, $4,000,000.

Because of the unsettled conditions in road building which obtained during 1919 and 1920, the larger part of the above bond issues remains to be expended during the coming year.

In 1920 a total of $309,000,000 of state highway bonds have been authorized as follows:

Alabama, $25,000,000; Idaho, $2,000,000; Oregon, $10,000,000; Colorado, $5,000,000; Maryland, $3,000,000; Minnesota, $75,000,000; West Virginia, $50,000,000; Missouri, $60,000,000; Virginia (amount not fixed), $50,000,000; New Jersey (tunnel and bridge), $29,000,000.

The constitution of Kansas prohibited the state from engaging in internal improvements, but this difficulty was removed by the referendum at the recent general election on Nov. 2. The state may now pay a quarter of the cost of not more than 100 mi. in each county, such state aid not to exceed $10,000 per mile.

The amount of bonds authorized in the state of Virginia was not fixed in the referendum measure, but the Legislature may, under the law, vote road bonds to the extent of $50,000,000.

A proposal was approved in California increasing the interest on the state highway bonds to not more than 6%, thus permitting the state to dispose of the $40,000,000 road bonds bearing 4¼% voted in 1919.

During the past year bond issues have been authorized in the various counties of the United States amounting to approximately $362,000,000. The amounts authorized in each state are as follows:

Alabama, $5,000,000; Arizona, $8,400,000; Arkansas, $2,400,000; California, $24,635,000; Florida, $1,515,000; Georgia, $15,245,000; Indiana, $7,373,000; Illinois, $8,862,845; Iowa, $18,475,000; Kansas, $50,000; Kentucky, $1,700,000; Louisiana, $5,850,000; Michigan, $2,300,000; Minnesota, $12,800,000; Mississippi, $15,773,000; Missouri, $13,504,000; Montana, $6,283,000; Nebraska, $3,000,000; Nevada, $1,200,000; New Mexico, $200,000; North Carolina, $13,609,000; Oklahoma, $1,158,000; Oregon, $9,696,704; Pennsylvania, $21,337,553; Rhode Island, $8,500,000; Tennessee, $7,185,000; Texas, $86,023,000; Vermont, $2,766,000; Washington, $8,225,000; West Virginia, $7,039,200; Wisconsin, $36,525,000; Wyoming, $2,800,000.

Officials of the U. S. Bureau of Public Roads estimate that there is still available approximately $160,000,000 of federal aid funds for allocation to projects in the various states. This amount, together with funds obtained from bond issues, direct levies, motor vehicle fees and other state taxes, and county bond issues and appropriations, will make over $1,000,000,000 available for road work in 1921. However, probably not more than one-half of this amount will be expended during the coming year.

At the recent general election, the following bond issues were defeated:

Florida, $20,000,000; Montana, $15,000,000; Washington, $30,000,000; New Mexico, $2,000,000.

In Florida and Washington it was intended to use the motor vehicle fees to take care of the bond issues.

The proposed change in which the state highway engineer of Arizona was to have been supplanted by a commission of five members was also defeated at the recent election.

Illinois Will Mark Highways

Concrete sign posts will be placed at all cross roads on the three state aid highways which have been completed this year, according to S. E. Bradt, State Superintendent of Highways. The markers will be 6 ft. high and will bear in large black letters the name and distance to the next municipality and the number of the route. Below the route number will be the letter "L" or "R" to indicate a right or left turn.

Average Prices of Road Construction Work in Iowa During 1920

Average prices of road construction work prevailing in Iowa in 1920, based upon approximately $8,000,000 worth of contracts, are contained in the monthly bulletin of the Iowa State Highway Commission.

A total of 357 mi. of earth excavation, involving 2,998,700 cu. yd., was contracted for at an average price of $1.22 per cubic yard.

A total of 339,657 cu. yd. of earth excavation incidental to paving, was contracted for at an average price of $1.22 per cubic yard.

A total of 115.81 mi. of concrete paving, exclusive of grading, was contracted for at an average price of $3.988 per square yard.

A total of 17.24 mi. of brick paving with bituminous filler, exclusive of grading, was contracted for at an average price of $5.665 per square yard.

A total of 144 mi. of gravel surfacing, involving the loading and hauling of 206,447 cu. yd. 1 mi. was contracted for at an average price of 89.1 ct. per cubic yard, with 737,323 units of additional .5-mi. haul at 24.75 ct. per cubic yard.

Highway Fatalities in New York State

During the month of November, 164 persons were killed on the highways of New York. Of this number, 17 met death at railroad grade crossings. In New York City, 79 persons were killed by automobiles in November.

Road Work in Tarrant County, Texas

During 1920 surveys have been made and plans prepared on 13 projects aggregating 69 mi. in Tarrant County, Texas. Contracts for grading, drainage and native stone base have been let on eight projects aggregating 39 mi., at a total cost of $739,369. Five concrete bridges, costing $34,956, have been completed in addition to the above work.

Stimulating Road Interest in Georgia

In order to stimulate interest of the citizens of a county in southern Georgia in turning out to gravel the roads, a county official placed the following verses upon his office wall:

"This road is impassable,
Not even jackassable;
And he that would travel it,
Must turn out and gravel it."

Streets Repairs With Lead Chats

City of East St. Louis Makes Satisfactory Use of Refuse from Lead Mines Near Joplin

The City of East St. Louis, Ill., is using lead chats from the lead mines at Joplin, Mo., for repairing streets, according to a recent statement of Arthur O'Leary, Commissioner of Streets. The lead chat has the appearance of limestone with numerous dark streaks. It is very heavy and is being used by many cities in the Middle West for filling chuck holes and uneven places.

"This lead chat," says Commissioner O'Leary, "packs tightly and soon becomes a compact, heavy mass that has excellent qualities as a wear resister. It is heavier than ordinary chat and costs less. We get the material shipped from the Joplin, Mo., lead belt, where there are mountains of it, for very little more than the freight cost.

"Many cities are now using this new filler and many cities are even laying whole streets of it. It is declared by highway engineers to be the best available material obtainable for repairs such as we are making on the city's paved streets."

Bridge Company To Be Penalized

A penalty of $50 a day, accumulating since Jan. 1, 1916, will be imposed upon the International Bridge Co., of Buffalo, N. Y., for failure to provide its Black Rock Harbor Bridge at Buffalo with a vehicular passageway, according to a statement by Attorney General Newton. This action will be taken in accordance with the decision of the U. S. Supreme Court against the bridge company.

The company was directed to build a vehicular passageway by a legislative act, which provided for the fine for each day's delay in compliance with the statute.

National Research Council Organizes Advisory Board on Highway Research

Plans to Secure Federal Aid to Organize Staff of Experts for Highway Research

Representatives of twelve national highway and technical organizations and several engineering schools were present at a meeting on Nov. 11 under the auspices of the Engineering Division of the National Research Council. The meeting was held in the Engineering Societies Building, New York City, and an Advisory Board on Highway Research was formed, with Dean Marston, of Iowa State College, as chairman.

This board plans to secure the cooperation of the U. S. Government in financing its work so that a staff of highway engineers may be engaged to carry on research work. A director of research will be appointed. A chairman and vice chairman of the board and three members of the Engineering Division of the National Research Council will compose the executive committee.

Membership in the Advisory Board of Highway Research will be open to national organizations interested in highway development, governmental departments and engineering schools, each organization to have an appointed representative.

Among the national societies represented at the meeting were the American Association of State Highway Officials, the American Society for Testing Materials, the Society of Automotive Engineers, the National Automobile Chamber of Commerce, the American Concrete Institute and the American Automobile Association. The U. S. Bureau of Public Roads was represented by Thomas H. MacDonald, A. T. Goldbeck, and C. D. Curtis.

Committees on organization and by-laws, membership and research were appointed.

MEETINGS

Calendar of Coming Meetings

Dec. 13-16,—American Association of State Highway Officials,—Sixth annual convention, Washington, D. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

Jan. 25-27.—Associated General Contractors of America.—Annual convention, New Orleans, La. Chicago, Ill.

City Managers' Association

The seventh annual convention of the City Managers' Association was held in Cincinnati, O., on Nov. 15, 16 and 17 with an attendance of about 100. Officers were elected for the ensuing year as follows: President, A. W. D. Hall, City Manager, Jackson, Mich.; First Vice President, Geo. M. Zimmerman, City Manager, Sandusky, O.; Second Vice President, Edwin J. Fort, City Manager, Niagara Falls, N. Y.; Third Vice President, Wilder M. Rich, City Manager, Goldsboro, N. C.; Executive Secretary, Harrison G. Otis, Tribune Bldg., New York City.

Subgrade Committee of Federal Highway Council

The Subgrade Committee of the Federal Highway Council held a meeting on Nov. 22 and 23 at Wilmington, Del., under the chairmanship of T. Coleman du Pont, of New York City. Among the speakers were W. P. Blair, Vice President of the National Paving Brick Manufacturers' Association, who pointed out that the population of the country has increased without any corresponding increase in transportation facilities; T. Coleman du Pont, who pointed out the necessity of studying foundation problems in road building; C. M. Upham, State Highway Engineer of Delaware, who outlined the work being done by Delaware in studying the bearing power of soils; H. G. Shirley, Secretary of the Federal Highway Council, who called attention to the fact that many roads wear out after giving service of much greater value than their actual cost, and S. M. Williams, Chairman of the Federal Highway Council, who spoke upon the importance of subgrade research work.

Among the other members of the committee attending the meeting were, H. J. Hughes, Dean of Harvard Engineering School; A. T. Goldbeck, Testing Engineer, U. S. Bureau of Public Roads; F. H. Eno, Professor of Engineering, Ohio State University; H. E. Hilts, of the Pennsylvania State Highway Department, and Ira B. Mullis, U. S. Bureau of Public Roads.

United States Bureau of Education

A conference was held on Nov. 26 by the Committee on Highway Engineering and Highway Transport of the U. S. Bureau of Education, at Pittsburgh, Pa. Because of the late arrival of P. P. Claxton, U. S. Commissioner of Education, Roy D. Chapin, Chairman, Highways Committee, National Automobile Chamber of Commerce, made the opening address. Mr. Chapin stated that 50% of the farm products raised in this country are not marketed because of poor roads and that the real problem of the farmer is one of transportation.

The theme of the morning session, which was held in Mellon Institute, was, "The Need of Education for Highway Development." Several prominent men identified with highway work spoke upon various phases of the subject, after which there was a discussion of proposed courses in road work to be instituted in the grammar and high schools.

Following luncheon in the banquet hall of Syria Mosque, the afternoon session was held jointly with the Educational Association of Western Pennsylvania and the Pittsburgh Teachers' Institute in Syria Mosque.

Dinner was served to the delegates at the University Club and the evening session was held in Thaw Hall at the University of Pittsburgh.

Canadian Good Roads Association

At a conference called by the Executve Committee of the Canadian Good Roads Association and held on Dec. 6 in the King Edward Hotel, Toronto, Ont., a number of representatives of contractors, material men and equipment manufacturers met with the officials of the association and discussed the highway situation for 1921.

Material and equipment producers stated that production had been increased to meet the increased road building activity and that the difficulties which had existed in the past season had been largely overcome. If transportation facilities were adequate, deliveries would be made with reasonable promptness, it was said.

It was the unanimous opinion of those present that the prices of road materials would remain firm during the coming season since production costs continue to remain high with little possibility of being decreased. However, it was the general opinion of those present that a more plentiful supply of labor would be available in 1921, although it was not anticipated that the wages of unskilled labor could be reduced more than 10 or 15%.

Because of the resignation of A. E. Foreman as president of the association, Dr. E. M. Desaulniers, Vice President, was elected president, and S. Latta, Second Vice President, was made vice president.

It was tentatively decided that the next annual meeting would be held at Halifax, N. S., early in March.

County Commissioners' Association of Indiana

The seventeenth annual convention of the County Commissioners' Association of Indiana was held on Nov. 16, 17 and 18 at the Hotel Severin, Indianapolis, Ind. One of the most important transactions at the convention was the preparation of a bill to be introduced at the next session of the Legislature, providing for an increase in the salaries of county commissioners. Another bill was drafted which provides for the revision of the county unit road law so as to permit payment of county councils for reviewing roads reported favorably by county commissioners.

Among the speakers were, L. H. Wright, Director, Indiana State Highway Commission; A. H. Hinkle, Chief Engineer of Maintenance, Indiana State Highway Commission; H. C. Boyden, of the Portland Cement Association; George E. Martin, of the Barrett Company, and E. Guy Sutton, Secretary of the National Association of Sand and Gravel Producers.

Custer Battlefield "Hiway" Association

The first annual convention of the Custer Battlefield Highway Association was held at Lewistown, Mont., on Oct. 25 and 26. This organization was formed to promote the improvement of the highway from Omaha, Neb., to Glacier National Park, traversing the states of Nebraska, Iowa, South Dakota, Wyoming and Montana, a distance of 1,475 mi.

Officers elected for the ensuing year are as follows: President, Geo. J. Weideman, Lewistown, Mont.; Vice President, W. H. Wallace, Sheridan, Wyo.; Treasurer, F. B. Gladden, Hardin, Mont.; Secretary, W. D. Fisher, Sheridan, Wyo.; Vice President for Montana, David Hilger; Vice President for Wyoming, Dick Stone; Vice President for South Dakota, W. W. Balin; Vice President for Iowa, S. Q. French; Vice President for Nebraska, H. E. Milliken.

PERSONAL MENTION

P. J. Mundy has been appointed city manager of Radford, Va.

H. L. Wilson has been appointed city engineer of Johnstown, Pa.

B. L. Meloy has been appointed assistant city engineer of Johnstown, Pa.

Roger Cassidy has resigned as road engineer of Fleming County, Kentucky.

R. R. Smith has been appointed highway engineer of Sonoma County, California.

W. H. Fairchild has resigned as city engineer of Galt, Ont., Canada, effective Jan. 31.

W. H. Sirmons has been appointed superintendent of roads of Terrell County, Georgia.

R. W. Jennings has resigned as county superintendent of roads of Terrell County, Georgia.

J. B. Dawson has been appointed maintenance engineer of the Kentucky Department of State Roads.

F. S. Greene, State Highway Commissioner of New York, will tender his resignation, effective Jan. 1.

H. A. Brazier, City Engineer of London, Ont., Canada, is now in England studying sewage disposal methods.

Frank Muth has resigned as highway commissioner of Manitowoc County, Wisconsin, to enter the contracting business.

E. R Bowie, formerly County Engineer of Uvalde County, Texas, is now engineer for the Leon Springs Irrigation Co., Fort Stockton, Tex.

Herbert McNab has been appointed acting city engineer of London, Ont., Canada, during the absence of H. A. Brazier, City Engineer.

E. A. Taylor, formerly Dstrict Engineer in Fayette County, West Virginia, is now project engineer with the Missouri State Highway Department.

Lou Alta Melton, the only girl in the graduating class in civil engineering in the University of Colorado last year, is now employed as assistant bridge engneer for the U. S. Bureau of Public Roads.

Simon Benson, Chairman of the Oregon State Highway Commission, and Mrs. Harriet King, of Hood River, are to be married, according to a recent announcement. Mr. Benson went to Oregon in 1878 and engaged in the lumber business. After some reverses, he met with great success and for years has been a powerful factor in the business life of the Northwest. Mr. Benson has contributed liberally to educational and civic improvements and has played an important part in the construction of the Columbia River Highway. Benson Polytechnic School and Benson Park are named in honor of him.

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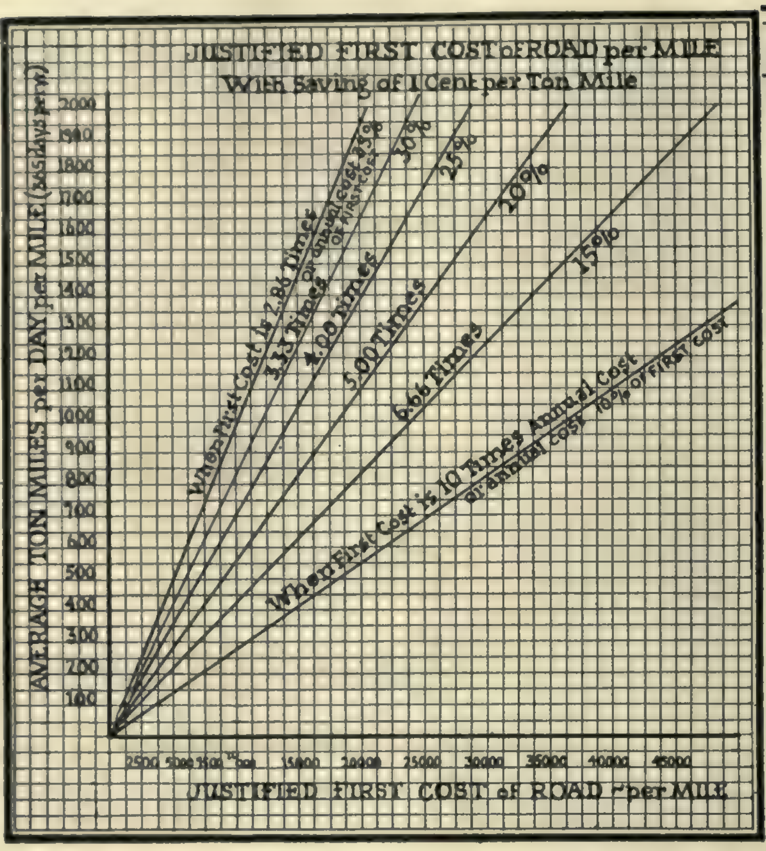

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Organization of a State Highway Maintenance Department*

By JOHN N. MACKALL†

It seems the irony of fate that the speaker should be asked to discuss this subject. He probably represents the only state highway department in the country which does not maintain a maintenance department. When he was asked to prepare the paper on this subject, he felt that "one was being put over" on the chairman of the program commitee, and the opportunity seemed to him too good to miss. Probably egotism in its highest form can go no further than to pit the judgment of one highway department against that of all the other 47 states, and if such is the case, the speaker must plead guilty of an exaggerated ego; yet it is his belief that Maryland has at this time one of the most efficiently and satisfactorily maintained systems of highways in the country, and this is accomplished without a maintenance department. In any event, it is rendering a "road service," which, dollar for dollar, is undoubtedly the cheapest in the country. This economical "road service" is possible partly because its roads were built when materials and labor were very cheap, and partly because, regardless of how weak the road was in the first instance, it has been and is being maintained today in a highly satisfactory state of repair.

The first question to arise, therefore, is "Why a maintenance department?" Is there not a tendency today toward over-organization rather than under-organization, and is not a state highway department a department of the state government, and is not this carrying departments far enough?

The principal argument which the speaker has heard for a maintenance department as separated from construction is that usually good maintenance men are poor construction men, and vice versa. To his mind, no greater fallacy ever existed than this. What makes a man a good construction, maintenance, designing, financing or even propaganda engineer? Is it not, in the final analysis, just plain "horse-sense," plus experience, and will not the same horse-sense plus experience which makes a good maintenance engineer also make a good combined maintenance and construction engineer? If he exercises good judgment as a construction or as a maintenance engineer, you may be assured that he will use the same good judgment in the combined positions.

Another argument often used is that if maintenance is separated from construction, the time, efforts and enthusiasm are concentrated and not divided. Enthusiasm is, of course, necessary, but actually does not the man immediately in charge of any piece of work supply most of this, so it is not necessary that the head of department or even the sub-head have it? The speaker's idea is that the judgment should come from the top, the enthusiasm from the bottom.

One of the greatest, if not the greatest, asset which any highway department has is the confidence of the public, and no highway department can continue longer than the public believes it is reasonably efficient and thoroughly honest, and certainly, willing to listen to reason. If this is true, and we look for the greatest source of danger from this point, where do we find it? In the lack of cooperation, lack of understanding and lack of appreciation on the part of the other department as to what is proper construction and proper maintenance. Too often, we hear of remarks made by the maintenance department that a certain piece of road cannot be maintained because it was not properly built. To put it as it is usually put, "See what that d— fool has done on construction," or "See what that d— fool is doing on maintenance." "Nobody can maintain a road as poorly built as this." "There is no use to construct a good road because it will not be maintained." It is impossible to keep these impressions from getting to the public and filtering through the public back to the department, and the speaker believes that too often this does not come to the department until it comes through the public. Is it not a fact that soon the public comes to believe that both the construction and maintenance departments are right—right in their criticism of the other? It is only human to believe the bad, not the good, and those of us who have felt the public criticism of a highway department believe that it is not human, at least, in this respect. Is not all the really good work which the department is doing being lost sight of in the criticism of the bad? Stop criticism in the department and you will stop it of the department. On the other hand, if maintenance is going to immediately and consistently follow construction in the hands of the same man, he will not say, nor permit anyone else to say, that the construction is not the best, that the alignments, grades, and details of finish are not the best that could be obtained, and any defects which do exist will be corrected as rapidly and as satisfactorily as possible, without criticism for their existence. In other words, the defects will be corrected, not criticized.

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*Paper presented at the sixth annual convention of the American Association of State Highway Officials, Washington, D. C., Dec. 13-16, 1920.

†Chief Engineer, Maryland State Roads Commission.

There can be no economical lines of demarcation between construction and maintenance, so why have any? Who will say that things are not done on construction which do not return ten cents on the dollar, when the cost of doing them on maintenance is considered? Take for instance, the question of shaping shoulders, sloping banks, etc. This work, done by the contractor, usually by hand, at a tremendous expense, is obliterated after the first rain. After this it is done with a road machine at probably less than 10% of the cost of the contractor's doing it by hand, yet, who has ever seen a construction engineer willing to accept from a contractor a piece of road unless the entire shoulders and slopes from beginning to end were in perfect state of repair on the day of acceptance, regardless of whether or not this would last for one day or one week after the road was actually accepted? The speaker does not want to be understood as unfavorable to reasonably well shaped shoulders and slopes, but they should not be done better than they can be maintained. Make no mistake, the ultimate consumer, the public, pays all the contractors' bills and a profit on them. Now, then, is the economical side of construction or of maintenance going to be ascertained except from an intimate knowledge of both, and how is this going to be had when the two departments are kept separate? It cannot be done. What is to be done as construction or left undone to be taken up as maintenance can be determined only by an intimate correlation of the two.

If it is remembered that the money, whether used for construction or maintenance, is the public's money, and that the public is interested not at all in whether it is named construction or maintenance, but only in seeing that it receives 100 cents for each dollar expended, the separate construction and maintenance department will disappear. This seems to the speaker generally and fundamentally a reason for not maintaining a maintenance department as separated from construction, and up to this point, nothing tangible and definite in the line of saving of money has been touched upon.

The speaker believes, moreover, that a large proportion of the overhead and traveling expenses can be eliminated by the combining of the construction and maintenance departments, and that much duplication must and does exist where these departments are separate. The State of Maryland, for example, has constructed probably as many of its main through roads as any state in the Union. It has connected by an improved road every county seat in the state, and in addition, every town of more than 1,000 people is connected with every other town of similar or larger size by an improved road maintained in almost perfect condition. Certainly, then, it would have less duplication of overhead and traveling than the states which have not connected up their main line system, yet, even in Maryland, construction and maintenance go together so closely that it is impossible to inspect and supervise construction without at the same time going over maintenance and vice versa. In states where the main line systems are not completed, and where construction sections immediately join maintenance, it is self-evident that expense is eliminated, but it is really equally true where the main lines are completed, because new construction on the branch lines immediately joins the main line maintenance. The speaker has reference only to connected systems and it is assumed that all departments are organized with hope and expectation of eventually having a connected system, if not now. Certainly, then separate construction and maintenance departments make a duplication of efforts, which can only mean duplication of expense.

Probably one of the most potent factors in arriving at the combined construction and maintenance department is the feature of reconstruction. "Reconstruction" is a word which probably should never have had a place in highway work. However, as the word has become used, the work called "reconstruction" must necessarily be done. The speaker will digress for a minute to explain this.

In a fundamentally correctly financed highway department, the funds for construction should come from the general funds of the state, whether this be by bond issue or by direct tax, and the funds for maintenance should come from current receipts, and unless receipts sufficiently large for all maintenance charges are provided, bankruptcy is the only ultimate result.

The trolley lines, for example, were constructed and operated on a nickel fare, until maintenance was necessary, then they went into bankruptcy, receivers were appointed and a reorganization effected, which meant putting in more capital for replacements, and again running for the same old nickel, which paid for operating only, and left nothing for betterments. After this was done several times, and with the creation in many states of public service commissions, really scientific studies were made of rate making and everybody began to holler "water," when it was discovered that the lines were not worth nearly what they had cost. In most cases, it wasn't "water", it was a case of the trolley financiers fooling themselves, when they thought they were fooling the public. Many trolley lines in 1914 could have been reproduced for less than half their capitalization, some of them for one third. The difference isn't "water"—certainly not all of it, but is the inevitable result of using new capital for maintenance instead of earning it—just foolng themselves. It is hoped that the highway departments are going to profit by this, and insist on a maintenance fund sufficiently large for replacements, even if it isn't now the popular thing to do. Reconstruction, therefore, the speaker hopes will never be employed as such in highway work.

To return to our subject, then, the work called reconstruction is really maintenance, and should be charged against current receipts. Under a system of separate maintenance and construction organizations, how is reconstruction going to be handled? By reconstruction, the speaker means extensive reconstruction, essentially new construction, done by contract. For instance, why should the building of a sheet asphalt top on an old macadam or concrete base be under the maintenance department, and another section in the immediate vicinity built on the identical specifications, but on a new base, be under the construction department? To pursue the contrast further, take as an illustration the work Maryland has just done on the 50-mi. section from Washington to Baltimore and on to Belair on the road to Philadelphia. This consisted, in a few cases, of replacing the 14 ft. wide macadam with 20 ft. of concrete, but in most cases, of constructing a strip of concrete 3 ft. wide on each side of the macadam. Under Maryland's system of financing, then, the work done on the 14-ft. macadam was charged to maintenance, and the additional width of 6 ft. to construction. Under separate organizations, would it all be done by the construction or the maintenance department, or would each one have done its portion of the work? This may be an extreme case, but it demonstrates conclusively that maintenance and construction are inseparable in execution, so why maintain separate organizations?

Now, then, having disposed of the reasons leading up to the organization of the construction maintenance along similar lines, and of the saving in overhead in connection therewith, the speaker will be pardoned for the personal references, but the organization which he is now maintaining will be described as it represents his best judgment at this time.

The State Roads Commission of Maryland, as at present constituted, consists of three members, of which one is the chairman; and the law provides for a chief engineer and assistants. The commission, in organizing, selected the chairman as chief engineer, so that the authority and responsibility is concentrated at the top as much as it is possible to do so. The department is further organized in an assistant chief engineer, who has such duties as are specifically entrusted to him by the chief engineer, pertaining to all phases of the work, surveys, plans, construction, maintenance and costs. In all his dealings he acts for the chief engineer and in his stead, so that all reports to him have the force of reporting to the chief engineer. The next are the district engineers, there being seven of these, doing the work in Baltimore City and the 23 counties of the state, averaging a little more than three counties to a district. The district engineer, therefore, is really the first sub-division lower than the chef engineer, there being neither construction nor maintenance engineers in the department, and he handles and is responsible for both construction and maintenance in his district. The maintenance work is further divided approximately into counties, with a superintendent for each county. The maintenance superintendents and construction inspectors are interchangeable, so that it is possible to fill the position of district engineer from within the ranks of the organzation. The purchasing agent, working directly under the chief engineer, is responsible for the purchasing and delivery of all materials. The materials as required by the district engineer are requisitioned of the purchasing agent, with specifications as to quality, time and point of delivery. Centralized purchasing was always desirable in that it stopped competition for price and delivery within the department, but the difficulties in obtaining materials and in their transportation during the last few years have demonstrated the absolute necessity for it.

All requisitions are forwarded by the district engineer to the chief engineer for approval and order of delivery, and then to the purchasing agent, who places the order and effects delivery to the point of destination on the railroad or water, at which point the responsibility for ultimate delivery, that is, hauling, is with the district engineer.

Maintenance, other than extensive reconstruction done by contract and referred to before, is effected

(Concluded on page 284)

Analyses and Preparation of Estimates*

By H. J. KUELLING†

In view of the rapidly changing economic conditions in the past and the uncertainty as to the future, estimates have been giving and are going to give highway engineers considerable trouble. There has been and will be great doubt as to whether or not bids should be accepted.

The question of estimating will be discussed in this paper from the standpoint of a state department and not from the standpoint of an individual.

It is assumed by the writer that the economical type to be constructed has been previously selected. This statement is made because of the fact that in making estimates, factors are very often uncovered which warrant a change in type. Since this subject is properly covered under other papers at this meeting, it will not be discussed here.

Before any figures are made on an estimate, the engineer must carefully analyze all conditions surrounding the work. In other words, he must spend time in seeking out all local information relative to every feature of the work. This local information may pertain to availability of materials; freight rates; railroad accommodations, as to sidings and train service; camp sites; water supply for these camps; availability of supplies for these camps, whether they come from merchants or farmers; the soil conditions, whether or not they are conducive to a small weather loss; whether the sand is so soft that it will interfere with the movement of equipment such as wheelers, or wagons; the kind of clearing and grubbing, whether there are deep rooted trees or flat rooted; the type of marsh conditions, if there are any, wheher it is possible to work horses or equipment on them; the kind of grades that may be encountered in the work, which will have a bearing on the hauling of materials, or the pumping of water. In fact, he must seek information on a great variety of subjects.

In seeking knowledge of materials he must know the capabilities of commercial concerns to ship, whether they are in a position to get cars, whether they have the proper capacity to turn out the amount of material they are liable to contract for; whether their material is satisfactory; the business reputation of the concern, whether they will keep their word or not, that is, whether they will ship in accordance with promises or whether they will ship to someone that comes along and offers them a higher price at a later date.

Seeking information on local materials, the engineer must be even more careful, as he must know the kind of materials available, the amount, especially if a gravel deposit, as these are likely to pinch out; he must know the cost and should have an option on it, so that one contractor by getting this option, cannot bar others from bidding.

The mere investigation of present used materials is not sufficient, as there are many cases where materials are being hauled several miles when there is a sufficiently good supply within a very short distance of the job. Entirely new and unknown sources of supply can be found in any state by a painstaking materials department. The changes of the freight rates, if there are any new increases, should be balanced against the extra distance that local materials can be hauled.

After an engineer has obtained or been furnished with all this local data, he is still very much handicapped in making his estimate, unless he has had considerable experience in actual construction. He should know the best methods of carrying on the work, what equipment to use, whether it be a grading or surfacing job.

With the amount of work that is being done by every state in the Union, the simplest, most practical and only satisfactory way to get this cost information is for the various states to do some of their work by force account. The writer knows that some states cannot legally do this, but believes that provision should be made so that they may. It will be surprising to many of you to find out the items that crop up and that must be paid for on a construction job. Some things are hard for an engineer to realize unless he has been through the mill. The state from which the writer comes has taken this stand for years past and has done a very great amount of certain types of work by force account. Up to the time of federal construction, this force account work was entirely in the hands of the county authorities and only under the general supervision of the state. Since the federal construction began, the state has undertaken a number of jobs by day labor and, in fact, in 25 of the 71 counties during the past season, part of the work has been done in this way. This does not mean that the majority or even a large per cent. of the work is done by force account, but enough is done so that the state will have first-hand and accurate knowledge of costs.

Owing to the variety of work and conditions, it requires several jobs along different lines. For instance, on concrete road construction during the past season, one job was run by day labor where the material was dumped on the subgrade and

(Continued on page 284)

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*Paper presented at the 6th annual convention of the American Association of State Highway Officials, Washington, D. C., Dec. 13-16, 1920.

†Construction Engineer, Wisconsin Highway Commission.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX DECEMBER 15, 1920 No. 24

MAINTENANCE IN MARYLAND

Somewhat unusual views on the road maintenance problem are given in a paper by John N. Mackall, Chief Engineer of the Maryland State Roads Commission, which is printed on other pages of this issue. His opinions and his description of the methods adopted by the Maryland department should prove especially interesting to road builders—the first because they differ so widely from those generally entertained, and the second because, to quote Mr. Mackall, the Maryland organization "is the only state highway department in the country which does not maintain a maintenance department."

It is quite generally held, we believe, that the qualifications and temperament required for maintenance work are quite different from those needed for construction and that in a state highway department or similar organization the best results are obtained by placing these two kinds of work under different heads. Mr. Mackall does not agree with this view, in spite of its apparent acceptance, as witnessed by the organization of practically all of the state highway departments in the country. In fact, he says that, in his mind, "no greater fallacy ever existed." Continuing, he says:

"What makes a man a good construction, maintenance, designing, financing, or even propaganda engineer? Is it not ,in the final analysis, just plain 'horse sense,' plus experience, and will not the same horse sense plus experience, which make a good maintenance engineer also make a good combined maintenance and construction engineer? If he exercises good judgment as a construction or as a maintenance engineer, you may be assured that he will use the same good judgment in the combined positions."

Mr. Mackall develops this theme at some length, setting forth opinions that merit the careful attention of the reader even if he cannot agree with them. There are two sides to every question and Mr. Mackall presents his, the minority, side in an exceptionally able manner.

GOOD ROADS AND PARTISAN POLITICS

Both purely theoretical considerations and observations of the conduct of actual work clearly and unmistakably indicate the unwisdom of admitting partisan politics into the administration of road building.

On the other hand, it requires no great knowledge of men and things to understand that it is, and probably always will be, impossible to prevent the mixing of the two to some extent. Road building is public work and must remain such and, by our present methods of government at least, public work is necessarily carried on by elected or appointed office-holders whose positions are often rewards for services to their parties.

Under the circumstances, the most that can be hoped for lies in measures to keep road building administrations as free as possible from the injection of politics in any other way. The mere fact that the head of a road building organization and many of his immediate subordinates are political appointees is not prima facie evidence of unfitness; many such officials are men of the greatest ability. But any tendency to permit political considerations to govern in carrying on the work should be guarded against and curbed if manifested.

So far, fortunately, road work has suffered comparatively little from political meddling. As its volume increases, however, the danger is going to increase, especially as it becomes a more and more important function of the Federal Government. As yet, federal participation is hardly sufficient to attract the attention of those politicians who see in any activity of government only an opportunity for private profit or personal preferment. In time, however, the sums secured from the federal treasury for road work are likely to be sufficiently great and the patronage sufficiently valuable to tempt the professional follower of politics.

If effective measures are to be taken to prevent road building from becoming a fertile field for pork barrel legislation the time to act is now. New federal aid measures probably will come up in the next Congress and it should be the business of road builders to see that proper safeguards are provided. As individuals, road builders may not be able to accomplish much, but through the American Road Builders' Association and other organizations they should be able to make their opinions carry weight that will count with the lawmakers.

Organization of a State Highway Maintenance Department

(Continued from page 281)

by the patrol system, supplemented by the gang system. The backbone of the maintenance system, however, is the patrolman, the man with the pick and shovel. It is the speaker's opinion that no road can be properly maintained without the patrol system, regardless of whatever else may be used. Properly maintained, as it is interpreted in Maryland, is perfectly maintained, certainly, so far as the surface is concerned. By this is meant that no hole of the smallest size is permitted to remain in any highway, and by this system the department is rendering a most satisfactory road service on very low types of construction, and at a most reasonable figure when interest and maintenance charges are considered. It is, of course, necessary at times during the year, especially in the spring, to supplement the patrolman with a gang, which probably does small sections of resurfacing, cleaning out ditches, culverts, dragging shoulders, etc., but this does not relieve the patrolman, but only supplements him. The gangs are under the direct supervision of the foreman in charge, but report to the maintenance superintendent in the district and he, in turn, to the district engineer. The gang is entirely independent of the patrolman, though the latter is at times employed in the gang.

On numerous occasions, it has been attempted to dispense with the services of the patrolman, but invariably it is found to be impossible to properly maintain the roads. One of the greatest difficulties wth patrol maintenance is that frequently the patrolman works inefficiently, and frequently, he works not at all. Yet the criticism which was often directed at the work of the commission in its early stages for permitting the patrolman to loaf and work inefficiently along the highway, is becoming recognized as a necessary adjunct to perfect maintenance. Whenever the services of the patrolmen have been dispensed with, public spirited citizens, true friends of the road movement in Maryland, have noticed that this has been done, and noticed that the roads were not being maintained in their usual, first class condition.

The speaker believes that there is as little loafing and unintelligent work done by the patrolmen in Maryland as any state in the Union, certainly, less than any state with which he has come in contact. This, he believes, is largely due to the fact that whenever inspections are made of either construction or maintenance work, the patrolman comes always under the eye of whoever is maing the inspection, the latter being always someone in authority on maintenance work.

In conclusion, the organization of a combined construction and maintenance department stops the greatest of American pastimes, that of "passing the buck." It concentrates in the hands of the district engineer undivided authority and undivided responsibility for the building of good roads and maintaining them in perfect condition. It stops criticism of bad construction, of bad maintenance, of things done and things left undone. It makes for a coherent organization, absolutely loyal, free from fault finding and back-biting, and no highway department can long stand continued fault finding, of which separate construction and maintenance organizations are certainly the greatest, if not the sole cause.

Efficiency is certainly the keystone in any organization. Combined construction and maintenance organization makes for efficiency of funds, a dollar does a dollar's worth of work by any name; efficiency of men in that one man does what two do otherwise; efficiency of results as reflected in Maryland's 1600 mi. of roads maintained in perfect condition in 1920 for an average of $600 per mile.

Analyses and Preparation of Estimates

(Continued from page 282)

handled by wheelbarrow. This material was shipped in from commercial plants to a special siding and transferred by a clam to side dump cars on an electric railway which ran along the highway and dumped directly on the subgrade. In another case, a local pit was developed and the material hauled to the road by trucks. It was then mixed and placed, the mixer being loaded with wheelbarrows. In a third case, a local pit was used, the concrete mixed at the pit, hauled in a mixed condition by industrial railway and placed on the subgrade with a large crane.

In grading operations one job was undertaken in a sandy soil; one in gravelly soil; one in clay soil; still another in very stony ground. Some work was done by steam shovels and some by wheelers and fresnos.

In a similar manner various kinds of gravel work were undertaken—some with sandy gravel, some with clay gravel, and some with gravel that would hardly be worthy of the name of gravel—in other words, really top soil.

With an accurate cost analysis of all of this work at hand, we feel that we are in much better position to determine whether or not the bids submitted to us are satisfactory.

After progressing this far in the making of an estimate, the writer believes that the states should have a regular system of making these estimates; in fact, he sees no reason why a committee from this organization could not develop a scheme or schemes for having all the states make their estimates in the same manner. This scheme, whatever it may be, should be after the same fashion and, in fact, can well comprise the very same forms that a contractor should use. There is no reason why the drawing up of such estimate forms could not be partly done by the contractors, or in conjunction with them.

This scheme of having the contractors work with the engineers has been tried out during the past year in Wisconsin, with more or less success.

A year ago, the Wisconsin State Highway Department called a two-day meeting of contractors, machinery men, material producers and the engineers of the state. A very open discussion was had regarding the relations of all parties concerned. At this meeting a committee was appointed, and instructed to draw up a form for making estimates. This committee was composed of five contractors, elected by the vote of the contractors themselves, one man from the aggregate producers, one man from the machinery manufacturers, three men from the county construction departments, and two from the State Highway Department. This gave a committee of five engineers, five contractors and two others who were vitally interested in the meeting. This committee met for three different sessions and I assure you that they were sessions at which work was done. The contractors, as a rule, were frank in their statements, and out of it grew an estimate form for one type of construction which seems to be fairly satisfactory to all concerned. No doubt it has many faults as yet, but it is a start in the right direction. This form is drawn up primarily for a concrete road job, but it can be very easily adjusted to other types of surfacing. The committee did not complete an outline for estimating grading work, but it is hoped that it will do so sometime in the near future. It did, however, touch upon certain features of it.

There is perhaps more guessing done in making grading estimates than in any other kind of road work. There is a greater need for some satisfactory method for estimating grading costs than for most kinds of road work. Too often the average haul is not even known. A greater use of the mass diagram would be beneficial.

The attendance of this committee was almost 100% and the meetings were lively, as many discussions arose. All points were finally amicably settled and the form is used quite freely throughout the state. The form as developed is divided into 16 subdivisions as follows: Cost of sidings; moving of equipment to the job; lost tme of moving equipment; cement; fine aggregate; coarse aggregate; surfacing; camp loss; miscellaneous cost; contingencies; compensation and public liability insurance; bond cost; overhead; profit; charges for machinery and equipment. Each of these items is subdivided into as many divisions as were considered necessary by the committee. Most of these items you will readily see are somewhat easy to determine, but others are not. Only a few will be discussed here.

Overhead, the committee finally put on a percentage basis. For instance, in figuring a job the contractor or the engineer would have to estimate the per cent. of the manager's time that would be required for the job, and then charge up that per cent. of his yearly salary to the job. The same plan is applied to his office force, time keepers, the expense of the manager, his office rent, supplies, etc.

Overhead also includes the corporation insurance, interest on the necessary working capital and any dues that may have to be paid to associations.

Upon the item "profit," I might say that the committee had a rather heated argument. Naturally, the contractors were anxious to obtain as much profit as possible and have the state officials agree to certain percentages. This, however, we refused to do and the per cent. of profit was left blank for the contractor to fill in as he desired. What we were seeking was primarily to get everyone to make their estimates along the same line and then let the contractor be his own judge on whether or not he could get the job with certain profits added on.

In the last item, charges for machinery and equipment, the committee had perhaps the most interesting discussions. Charges for surfacing machinery and equipment were worked out to certain percentages per mile of road constructed. For instance, under concrete pavers, we assume that the paver will build 30 mi. of standard 18-ft. road, at the end of which time it will be completely used up. The same result was obtained if we assumed that it would build 24 mi. and at the end of that time have a salvage value of 20% of the original cost. With the 30 mi. noted above, and an average per year of 6 mi., the life of the mixer would be five years. Depreciation, therefore, in five years equals 100%; repairs in five years at 10%, would equal 50% of the original cost; and interest, storage and insurance would equal 30% of the original cost. This would make a total of 180% of the total cost to be spread over 30 mi., or 6% per mile. In other words, in figuring the charges for machinery, the contractor, if it was a standard 18-ft. road, would merely multiply the number of miles by 6 and take that per cent. of the original cost of his paver as the amount to be charged to the particular job under estimation. In a similar manner, the committeee arrived at percentages for various types of equipment used in the surfacing work.

The per cent. on grading and hauling equipment naturally could not be arranged by miles. It must be worked on a time basis and cannot be as accurately determined as surfacing equipment, because of the greater variation in quantity and kind of excavation on different jobs. Final percentages have not as yet been arrived at by the committee for these types. The committee did state that including depreciation, interest on investment, storage, insurance and all repairs, but not including fuel, the percentage per operating day would vary from ¼% to ½% of the original cost, depending upon the kind of equipment.

There is no doubt that a continued use of this form will bring out points of weakness, but the writer believes it is a step in the right direction and that within a very few years standard forms of estimating will be in use for road work and that there is no reason why these same forms cannot be used both by the contractors and by the engineers.

There is also no doubt that adjustments will have to be made for certain local conditions which are not covered. Where there is something to guide, there is no reason why the contractor and the engineer should not be a little more in harmony than they have been in some cases in the past.

Short cuts in estimating are needed and can be devised by state departments. Care should be taken, however, not to make these too short. No scheme will ever be devised or charts drawn so that a novice can make highway estimates. It is only by the use of brains and knowledge of conditions influencing costs that proper estimates can be made.

Highway Program of South Dakota

Road work involving the expenditure of $5,000,000 is being planned by South Dakota for 1921, according to M. L. Slade, a member of the South Dakota State Highway Commission.

"Next year," says Mr. Slade, "will see three roads to the Black Hills to take care of the large number of vacationists who wish to go to the beauty spot of the state to spend a few weeks."

Road Work in North Carolina

The State of North Carolina has now 136 mi. of hard-surfaced roads under construction, involving an expenditure of $4,000,000, according to John E. Cameron, a member of the State Highway Commission. In addition there are 40 sand-clay and gravel projects under way. An expenditure of $11,000,000 is involved in contracts now in operation and projects under preparation.

Work on White Horse Pike Progresses

The construction of the White Horse Pike, between Philadelphia, Pa., and Atlantic City, N. J., is progressing steadily and it is expected that the road will be completed early in the spring. Considerable delay has been experienced in securing cement because of the lack of freight cars.

Road Work in Anderson County, South Carolina

Anderson County, South Carolina, has constructed 100 mi. of improved roads at a cost of $1,215,683. A balance of $184,000 remains from a $1,400,000 bond sale, from which $116,000 has been set aside for the construction of roads from Belton to Honea Path and Belton to Pelzer. The cost of these roads will be paid partly from federal aid funds.

Motor Clubs of New York State Protest Against Greene's Resignation

Following announcement of the action taken by the Troy, N. Y., Automobile Club, which has petitioned Governor-elect Miller to retain F. S. Greene as state highway commissioner, the other 127 local clubs in the New York Automobile Association are conducting a referendum to determine the attitude of the association upon the question. Returns from many of the clubs have been checked and have been in favor of the retention of the present commissioner, it is reported.

California Seeks To Speed Up the Sale of Highway Bonds

Attorney General Webb of California has been asked for a ruling which will permit the advertising of state highway bonds while they are being printed and signed. It is pointed out by State Treasurer Richardson that if the usual procedure in the preparation of bonds is followed, none of the state highway bonds bearing the higher rate of interest approved at the recent election will be available for sale by the commission before April 1, 1921. Consequently all new highway work will be needlessly delayed unless the bonds can be advertised and sold before that time.

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The City of Bend, Ore., is surfacing six streets and a bridge spanning the Deschotes River with Willite pavement.

The Supreme Court of Wisconsin has rendered a decision holding a county liable for damages in the case of an automobile being injured from hitting the end of a cement culvert, hidden by weeds. An automobile, in order to permit a tractor to pass, turned to the side of the road and struck the obstruction, which was not visible.

Secretary of Agriculture Urges More Federal Aid Appropriations

Asks Congress to Appropriate $500,000,000 To Be Spent on Roads in Next Five Years

Immediate consideration should be given by Congress to plans for extending the federal aid road building program, since the period for which the original act, as amended, terminates with the present fiscal year, declared the Secretary of Agriculture in his annual report to the President made public on Dec. 10. In order that there may be no halting in the work, it is hoped, he said, that Congress will provide additional funds, to be expended under the terms of existing legislation, with certain modifications, at the rate of $100,000,000 a year for the next five years.

"The principal modifications in mind," said the Secretary, "relate to the problem confronting the western states in highway work because of the existence in many of them of large areas of public lands, and to the maintenance of federal aid roads by the states rather than by the counties.

"The fact that the present appropriation may not be entirely expended by June 30, 1921, does not lessen the necessity of immediate action. Both the federal and state highway departments should know as promtply as possible, the program for the next five years, in order that the work may be adequately planned and the engineering and administrative details carefully executed. Forty of the state legislatures will be in session this winter, when it will be necessary for them to make appropriations for meeting future federal apportionments.

"Provision should be made also for the continued building, on an adequate scale, of roads within or adjacent to the national forests. The forest road systems are very closely related to those of the states and the major forest projects form important links in essential state and interstate highways. There are approximately 15,000 mi. of roads within the forests which connect with state and county highway systems. The building of forest roads, therefore, is an important part of the general road development plan of the West, both within and without the forest areas. In addition, the transportation of forest products, the protection and administration of the forests themselves, and their utilization for recreational purposes are all dependent upon the construction and maintenance of serviceable roads."

In view of the abnormal conditions which have prevailed since 1916, the report stated, the progress that has been made in placing a large highway improvement program under way is surprisingly good. In the years 1917, 1918 and 1919, there were approved 677 projects, calling for the construction of 5,790 mi. of road at a total cost of $56,418,673, of which the federal share was $23,931,618. During the fiscal year 1920, 1,670 projects submitted by the states, involving the improvement of 16,670 mi. and a total allotment of $109,830,366 of federal funds. were approved. At the end of the year 14,940 mi. of federal aid roads, on which $103,925,094 of federal aid funds had been allotted, were under consideration and in various stages of completion, while 1,677 mi. had been entirely completed. Preliminary engineering investigations have been made on 4,003 mi. of forest roads and construction has been completed, or is in progress, on 1,300 mi.

"It required a great national catastrophe to awaken the American public to the inadequacy of our transportation facilities and to the fact that we must depend largely upon our highways, in conjunction with motor vehicles, when a sudden expansion in transportation is essential," said the Secretary. "Our experience during the last three years has clearly demonstrated that the failure earlier to inaugurate a sound road improvement program has retarded the effective development of one of our most vital national requirements. The use of the motor vehicle for highway transportation has increased tremendously within a short period. The actual vehicle-mile use of our roads, it is estimated, has increased more than 500% in strictly agricultural communities and more than 1,000% near the larger centers of population. These figures indicate the extent to which community and short haul transportation will be served by better highways."

Road Plans of Cuyahoga County, Ohio

Cuyahoga County, Ohio, plans to build 40 mi. of highways, in 1921, involving an expenditure of about $3,000,000, according to a recent report of the county commissioners. Road work in 1920 was hampered because the commissioners found it impossible to sell bonds offering a maximum of 5% interest. Under a recent Ohio law, counties are now enabled to raise the interest rate on bonds to 6%.

Canadian Highway Officials in Automobile Accident

An automobile carrying F. C. Biggs, Minister of Highways of Ontario, W. A. McLean, Deputy Minister of Highways, and Geo. A. Hodgson, President of the Ontario Motor League, skidded on Nov. 9 at St. Catharines, Ontario, Canada, and the two rear wheels of the machine collapsed in coming in contact with the curb. None of the occupants were injured and after two new wheels were secured the party was able to return to Toronto.

The officials were returning from the opening of the new road from St. Catharines to Port Dalhousie, After the banquet tendered by the St. Catharines Chamber of Commerce, a parade was held and addresses were made by Mr. Biggs, Mr. Hodgson and others.

HIGHWAY TRANSPORTATION

The Motor Truck In Coal Mining

By the Use of Motor Trucks "Wagon Mines" Are Enabled to Load Coal Cars in One Day

Further evidence of the country's increasing dependence on the motor truck as a means of increased production and economical distribution, is seen in the present coal situation. In the movement of coal from the mine to the consumer, the motor truck each year becomes more important.

While most of us are familiar with the use of motor trucks in the distribution of coal from the dealer to consumer, another phase of coal transportation is that which centers about the movement of coal from what is known as the "wagon mine" to the railroad. Although most of these mines are small, there are thousands throughout the country and their total tonnage makes a considerable figure. In 1917, "wagon mines" in Iowa produced 522,122 tons of coal.

Because of inadequate loading facilities, railroads often find it impossible to furnish "wagon mines" with cars. However, some of these mines are now using motor trucks which facilitate the speedy transportation of coal so that coal cars can be loaded in one day. Consequently, the railroads are allotting more cars to these small mines with the understanding that the cars be loaded by night, an operation often impossible when horses were used in bringing the coal from the mines.

That this field of the motor truck is being rapidly developed is seen in the report of a Nash dealer whose territory includes a number of wagon mines. During the month of August he sold 10 Nash trucks and during September he sold 14 to "wagon mine" operators.

State Highway Department Truck Breaks Through Bridge

The necessity of strengthening and reconstructing highway bridges for motor vehicle traffic was recently brought forcibly to the attention of the California State Highway Department when a motor truck operated by the department broke through the wooden flooring of a bridge at Friedman's Crossing in Nevada County. The truck was loaded with timber and had passed over the center of the bridge when the stringers beneath gave way under the rear wheels. Fortunately, the lumber extending from the rear of the truck caught upon the sound flooring behind, preventing the truck and driver from falling to the bottom of the canyon, a distance of 200 ft.

Weigh Automobile Parts To Determine Amount of Wear

The U. S. Bureau of Standards is conducting experiments for the Motor Transport Corps in connection with their experiments on the deterioration of automobile parts in service. A number of bearings and gears have been accurately weighed on the bureau's balances and have been placed in cars in service. After a certain length of time these parts will be returned to the bureau and weighed again, the difference in weight representing the loss in metal due to wear.

The City of Philadelphia, Pa., is planning to divert motor trucks from Chestnut, Market and Broad Sts.

The California State Highway Department has purchased six loadometers and will carry on an active campaign against the overloading of trucks.

The County Court of Lane County, Oregon, has issued an order restricting the weight of loads to be hauled over the Mohawk Valley Road to 2,000 lb. This road extends from Eugene, Ore., to a number of lumbering towns.

A farmer of Potter, Neb., being unable to secure freight cars to ship his wheat, and because all local grain elevators were filled to capacity, recently carried 110 bushels of wheat on his motor truck to Omaha, Neb., a distance of 480 mi. The price which he received in the Omaha market was considerably above that prevailing at Potter.

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Governor McKelvie of Nebraska recently attended the ceremonies incident to the opening of the new paved highway from Lincoln to Ames.

The State of Pennsylvania collected $55,411 in in fines for violation of the motor vehicle laws during the first nine months of 1920. This is an increase of more than $20,000 over the amount collected durng the same period of 1919.

Dodge County, Wisconsin, plans to spend $1,000,000 in road work in 1921. Funds for this work have been provided for in the $5,000,000 vtoed by Dodge County a year ago. The program will include new work and the work on concrete highways which was abandoned this season because of labor and transportation difficulties.

EQUIPMENT—TRADE—MATERIALS

Safety Design in Road Machinery

By R. E. S. GEARE*

The Travelers' Insurance Company, of Hartford, Conn., has recently published an article pointing out the mechanical hazards of concrete mixers, especially pavers, and bewails the lack of attention given to this danger by the designing engineers of manufacturers.

"Guards for the exposed gears, belts, sprockets and chains, flywheels and other moving parts of the machines are the exception rather than the rule. Projecting set screws are quite common and they are always dangerous. All these moving parts are accident producers which might be eliminated with comparatively little expense or trouble. As an illustration of the seriousness of the accidents that may result from lack of safety precautions in connection with concrete mixers, we may mention the case where a man's coat was caught by a set screw. The man was unable to release himself and was drawn against the unguarded gears of the mixers. His chest and right shoulder were crushed and he died almost immediately."

In addition to the dangers mentioned above, there are other details in the design of most pavers which make them unnecessarily dangerous. On Oct. 15 one man was killed and three men were severely injured when a concrete mixer being used to pave a street in Chicago, Ill., overturned.

In addition to endangering the lives of the workmen, the paver that is not properly balanced is a dangerous thing for the contractor from the investment standpoint. When a paver turns over, the production loss is a serious consideration.

Frequently the loading skip has been known to drop upon the heads of workmen passing beneath it. Most pavers are not designed to avoid that danger.

The low boom of most boom and bucket pavers places another hazard in the path of the workmen. If the boom is not high enough to pass over the heads of these workmen, they are always in danger of being hit in the head or knocked down by the swinging boom.

A study of the design of a certain paving mixer shows that the company manufacturing it has realized fully the value of designing "Safety First" into its machinery. Although the drum of this machine is high from the ground, its heavier parts are underslung in such a manner that the center of gravity is lower than on any of the pavers of low drum design. A perfect balance on both a horizontal and vertical plane has been figured out so that its overturning is an impossibility under any conditions that may be encountered on road work. All gears are completely guarded and a specially designed brake on the loading skip makes accidental dropping of the skip impossible. As an extra precaution, guard rails are provided so that workmen can not pass under the raised skip. Because of the high drum design, the drum swings over 7 ft. from the ground.

It is certain that accidents on road work could be reduced considerably if all manufacturers of pavers and other road machinery gave more careful attention to designing for the safety of the workmen. By designing safety into their machines, they would aid the success of the contractor considerably because, aside from the humanitarian viewpoint, accidents are costly and cause unnecessary delays. Contractors should look into the mechanical hazards of every machine they buy and bring pressure upon the manufacturers to pay more attention to safety designing. It is a fact, too, that almost always the manufacturer who has given safety a place in his designing has also produced features of additional efficiency in his machinery.

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*General Sales Manager, The T. L. Smith Company.

Automatic Meter Pump For Concrete Mixers

A device has been designed by an engineer of the Austin Machinery Corporation, Chicago, Ill., which measures the water discharged in concrete mixers and paving machines. Preliminary tests recently completed show, it is stated, that this machine insures a uniformly accurate quantity of water for each batch.

The operation of the device, which consists of a pump, a valve, a timer and pipe and fittings, is effected by setting a pin for the exact quantity of water required in the mix, the pin being set but once for the job. The pump is driven from the mixer shaft and can lift water 12 ft. or take water from a hydrant. When the predetermined amount of water flows into the mixer, the water is automatically shut off.

The Goodyear Tire and Rubber Co., Akron, O., has reduced its daily output from 16,000 to 12,000 tires by operating four days a week.

The Warren Brothers Company will remove its general offices on Jan. 1, to the Parkman Bldg., 9 Cambridge St., Boston, Mass.

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Safety Design in Road Machinery

By R. E. S. GEARE*

The Travelers' Insurance Company, of Hartford, Conn., has recently published an article pointing out the mechanical hazards of concrete mixers, especially pavers, and bewails the lack of attention given to this danger by the designing engineers of manufacturers.

"Guards for the exposed gears, belts, sprockets and chains, flywheels and other moving parts of the machines are the exception rather than the rule. Projecting set screws are quite common and they are always dangerous. All these moving parts are accident producers which might be eliminated with comparatively little expense or trouble. As an illustration of the seriousness of the accidents that may result from lack of safety precautions in connection with concrete mixers, we may mention the case where a man's coat was caught by a set screw. The man was unable to release himself and was drawn against the unguarded gears of the mixers. His chest and right shoulder were crushed and he died almost immediately."

In addition to the dangers mentioned above, there are other details in the design of most pavers which make them unnecessarily dangerous. On Oct. 15 one man was killed and three men were severely injured when a concrete mixer being used to pave a street in Chicago, Ill., overturned.

In addition to endangering the lives of the workmen, the paver that is not properly balanced is a dangerous thing for the contractor from the investment standpoint. When a paver turns over, the production loss is a serious consideration.

Frequently the loading skip has been known to drop upon the heads of workmen passing beneath it. Most pavers are not designed to avoid that danger.

The low boom of most boom and bucket pavers places another hazard in the path of the workmen. If the boom is not high enough to pass over the heads of these workmen, they are always in danger of being hit in the head or knocked down by the swinging boom.

A study of the design of a certain paving mixer shows that the company manufacturing it has realized fully the value of designing "Safety First" into its machinery. Although the drum of this machine is high from the ground, its heavier parts are underslung in such a manner that the center of gravity is lower than on any of the pavers of low drum design. A perfect balance on both a horizontal and vertical plane has been figured out so that its overturning is an impossibility under any conditions that may be encountered on road work. All gears are completely guarded and a specially designed brake on the loading skip makes accidental dropping of the skip impossible. As an extra precaution, guard rails are provided so that workmen can not pass under the raised skip. Because of the high drum design, the drum swings over 7 ft. from the ground.

It is certain that accidents on road work could be reduced considerably if all manufacturers of pavers and other road machinery gave more careful attention to designing for the safety of the workmen. By designing safety into their machines, they would aid the success of the contractor considerably because, aside from the humanitarian viewpoint, accidents are costly and cause unnecessary delays. Contractors should look into the mechanical hazards of every machine they buy and bring pressure upon the manufacturers to pay more attention to safety designing. It is a fact, too, that almost always the manufacturer who has given safety a place in his designing has also produced features of additional efficiency in his machinery.

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*General Sales Manager, The T. L. Smith Company.

Automatic Meter Pump For Concrete Mixers

A device has been designed by an engineer of the Austin Machinery Corporation, Chicago, Ill., which measures the water discharged in concrete mixers and paving machines. Preliminary tests recently completed show, it is stated, that this machine insures a uniformly accurate quantity of water for each batch.

The operation of the device, which consists of a pump, a valve, a timer and pipe and fittings, is effected by setting a pin for the exact quantity of water required in the mix, the pin being set but once for the job. The pump is driven from the mixer shaft and can lift water 12 ft. or take water from a hydrant. When the predetermined amount of water flows into the mixer, the water is automatically shut off.

The Goodyear Tire and Rubber Co., Akron, O., has reduced its daily output from 16,000 to 12,000 tires by operating four days a week.

The Warren Brothers Company will remove its general offices on Jan. 1, to the Parkman Bldg., 9 Cambridge St., Boston, Mass.

MEETINGS

Calendar of Coming Meetings

Dec. 13-16.—American Association of State Highway Officials.—Sixth annual convention, Washington, D. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

Jan. 25-27.—Associated General Contractors of America.—Annual convention, New Orleans, La. Chicago, Ill.

Highway Engineering Conference at Philadelphia

Officials of the state highway departments of Pennsylvania, Delaware, New Jersey and Maryland, together with officials of the Bureau of Surveys of the City of Philadelphia and the U. S. Bureau of Public Roads, will cooperate in holding a highway engineering conference in Philadelphia, Pa., Feb. 14-19, 1921. This conference will be held under the auspices of the Department of Engineering of the University of Pennsylvania.

The Advisory Committee of the conference consists of, W. D. Uhler, Chief Engineer, Pennsylvania State Highway Department; C. M. Upham, Chief Engineer, Delaware State Highway Department; John N. Mackall, Chairman, Maryland State Roads Commission; T. J. Wasser, State Highway Engineer of New Jersey, and Geo. S. Webster, Chief of the Bureau of Surveys, Philadelphia, Pa.

The Civil Engineering Department of the University of Pennsylvania has arranged to give a short course in highway engineering from Jan. 24 to Feb. 11, 1921. During the third week of this course lectures will be given by eminent highway engineers.

PUBLICATIONS

AMERICAN RURAL HIGHWAYS. By T. R. Agg, C. E. First Edition. Cloth, 6x8 in., 130 pages. Illustrated. McGraw-Hill Book Company, Inc., New York, N. Y.

This book considers the subject of rural road construction and maintenance in a general way so that it is adapted for use as a text or reference by students not taking specialized engineering courses. Such a work as this is of value because its use will foster the diffusion of correct information about the construction and use of highways to agricultural and other students who are unable to pursue more extended courses in the subject. Because of the absence of mathematical ramifications, this book ought to be widely read by persons indirectly interested in road development, such as bankers, county commissioners, etc. To them it will furnish simple engineering facts, of which the American public is woefully ignorant.

CONSTRUCTION OF ROADS AND PAVEMENTS. By T. R. Agg. Second Edition, Revised and Enlarged. Cloth, 6x9 in., 463 pages. Illustrated. McGraw-Hill Book Company, Inc., New York, N. Y.

The more important new material included in the second edition of this book is that on assessments for pavements, a chapter on drainage and the control of erosion, a chapter on maintenance, a section on proportioning aggregates for the construction of concrete roads and the chapter on testing highway materials, which is completely rewritten. By including the more recent approved practice in road and pavement construction and maintenance, this book furnishes an excellent text for engineering schools, as well as a reference book for highway engineers. Written in an easy and clear style and illustrated with numerous diagrams and photographs, it is a most lucid presentation of the subject.

PERSONAL MENTION

Victor Searcy has been appointed county engineer of Wood County, Texas, succeeding S. B. Davis, resigned.

Wallace H. Shafer has been appointed road superintendent of Armstrong and Clarion Counties, Pennsylvania.

Maurice P. Morarity has been appointed assistant city engineer of St. Paul, Minn., and will be in charge of street gradng, sewer and sidewalk work.

Chas. T. Topping, formerly with the Chas. T. Topping Machinery Co., Pittsburgh, Pa., and more recently with the Lakewood Engineering Co., is now in the construction machinery business for himself in Pittsburgh. Mr. Topping will act as district sales representative for the Austin Machinery Corporation.

OBITUARY

Wm. T. Becker, for the past 18 years New England Manager of the Acme Road Machinery Co., died in Boston, Mass., on Dec. 3.

Charles J. McDonough, Division Engineer of the New York State Highway Department, died in his office at Buffalo, N. Y., on the afternoon of Saturday, Dec. 11. Mr. McDonough had influenza in the fall of 1918 and had never entirely recovered. He was 46 years old and was a graduate from Saint Joseph's College and from the Rensselaer Polytechnic Institute. Before his connection with the State Highway Department, he was in charge of design and other responsible work for the New York State Barge Canal Commission.

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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JAMESTOWN, N. Y., DECEMBER 22, 1920

Number 25

Relative Service Value of Different Types of Rural Pavements—I*

By A. R. HIRST†

The term "relative service value" is itself open to various interpretations. It might be held to cover only the potential power of a pavement to bear traffic of various amounts regardless of cost or economics, or it might be held to include the two latter factors. The author prefers to include the latter, and hopes that the program committee and the members will excuse the possible overlapping due to this interpretation.

Among the characteristics usually listed as important in determining the service value of pavements, are the following: Freedom from dust; appearance; character of foothold; ability to clean; freedom from sanitary objection; character as regards noise; freedom from slipperiness; low tractive resistance.

Almost without exception, the characteristics cited above are among the least important of the matters to be considered in determining the service value of rural pavements. Some, or all of these factors, are worthy of consideration in specific cases, but it has been our experience that one, or all of them combined, has had no important bearing upon 10% of the decisions reached in actual practice. They have a much larger value in city and village paving than in rural highway construction.

The predominant factor in determining the relative service value of pavements is whether or not they serve the traffic effectively and cheaply. It may be given as a truism that given effective construction and proper width almost any one of a dozen different pavements will give good service. The question to be determined by the highway engineer is whether they will give good service cheaply.

Traffic.—Highway traffic is, of course, the first factor to be seriously considered in connection with pavement economics. Traffic is the thing which makes highway surfacings necessary and the thing which wears them out. The amount and character are important and should always be taken into account.

We are going to shock a good many of our more theoretical brethren by saying that a preliminary traffic census is absolutely valueless in helping to determine the type of surfacing to be used. An inspection of the location of a road on the map, a knowledge of its relation to other roads and to the general highway system, and to business centers, together with a consideration of the business tributary to it and probably to be tributary to it, will tell a highway engineer, who at all knows his business, whether the construction in question should be first, second, or third class. The traffic on a road last year or last month has absolutely no value in this connection, because when a highway becomes a part of a superior highway system, or when one highway is paved with a surface superior to that on the adjacent and competing highways, traffic is so concentrated on that highway that what has been is no indication of what will be. Neither can anyone foresee from the fact that 100 automobiles a day passed over a highway on the 19th of June last, how many vehicles will pass over it on the 19th of June, 1932.

Any assumption of what traffic will be is merely an assumption, and the presence on a certain past day of 100 automobiles, 10 trucks, 8 farmers or their wives in single buggies and three babies in their perambulators has really no bearing on the future situation.

Traffic counts have value only as serving to give accurate information as to the constantly occurring changes in traffic conditions and in determining the relative cost of service per unit given by various pavements. The unit cost per ton of carrying traffic is the important consideration and, unfortunately, we have little or no information on this point.

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*Paper presented at the sixth annual convention of the American Association of State Highway Officials, Washington, D. C., Dec. 13-16, 1920.

†State Highway Engineer of Wisconsin.

The fact that this type of pavement was maintained for so much per annum and this type for so much per annum means little, unless we know the amount and weight of the traffic served and that it was served adequately.

Even then the information would not be conclusive, because the pavement which gave this unit cost under the prevailing soil and climatic conditions might give an entirely different unit cost under different soil and climatic conditions. A light, sandy gravel on a clay soil will give excellent service value if the rainfall is heavy and well distributed, while it would be totally unsatisfactory under the same traffic in an arid region or in one subjected to only seasonal rains.

Weight of Traffic.—Among the important circumstances affecting the service of pavements is the weight of the traffic which the pavement bears.

American highway engineers have been censored by the unthinking for having built roads which have not stood up under the intense motor truck traffic of recent years. It would be just as sensible to condemn a railroad engineering department for the failure of railroad bridges under engines weighing 200 tons, when the bridges were designed for engines weighing 20 tons. Before new and heavier loads are allowed on any length of railroad, all parts of the construction are examined and, if necessary, strengthened or rebuilt before the new traffic is allowed to pass over them. There has been nothing of this in highway practice. Loads almost without limit have been placed upon highways designed for conditions existing and anticipated a decade ago, and condemnation has resulted when the inevitable failure of the road structure ensued.

It would seem that it would be clear to even the feeblest minded that it is not going to be possible for the designers of vehicles using highways to turn loose upon highways any behemoth their ingenuity may design at any time they feel like doing so. It isn't possible to reconstruct the highway system of America every few months, or even every few years.

It is imperative that the several states adopt uniform standards for the loads to be borne by roads of the different classes of importance. It is going to be difficult to do this, because when a motor vehicle is once started towards its destination its operator will wish it to carry its full load for the whole trip, but it seems inevitable that we must classify highways as to the allowable loads upon them and that traffic on highways must be made to conform to these loads.

It is undoubtedly going to be possible for the states to ultimately finance the construction of roads which will, every day in the year, permit loads of 12 or 15 tons or, if the economics of transportation really justify it, even more, between their congested centers and on certain through highways. But it is just as certainly going to be impossible for the states to finance the construction of any great percentage of their roads so that they will stand such loads every day in the year, and I believe that on the secondary roads and roads of the lower classes, much lower load limits must be insisted upon, especially at certain seasons.

The importance of this matter upon the design of pavements and upon the service of the several types cannot be over-estimated.

Continuous Travelability.—One of the intangible factors in the service value of types of pavement is the factor of continuous travelability. It goes without saying that given two pavements of equal annual cost, and given one which is out of service for several days each year and probably for two or three months at several times during the assumed pavement life, while the other one allows the passage of traffic during its life with practically no inconvenience and no detouring, the choice would immediately fall upon the one which gives the superior travelability. Furthermore, if the maintenance of one type demands, annually or semi-annually or periodically, the application of such materials that traffic cannot be accommodated during this application or, if accommodated, is subject to possibility of accident from slipperiness and to defacement of vehicles and clothes, it is a serious impairment of the service value of the pavement.

I hope I may be permitted to say at this point that one of the strikingly characteristic things about American highway practice has been the almost total disregard for the comfort, convenience, and economy of the traveling public during construction, maintenance and reconstruction. A "public-be-damned" policy has been quite generally practiced. The traveling public has been considered as an interloper, with no possible business save to pay the bills. He has been stopped from passing through main roads without any option of detours being offered him. He has been not stopped by barriers and has been encouraged to go upon construction and maintenance work which has impaired and defaced his tires, his vehicle, his clothes, and his religion, to the extent of hundreds of thousands, and, possibly, millions of dollars. Even where detoured, he has been only in very few cases properly guided along the whole length of the detour, and even where the detour has been marked, almost without exception it has not been maintained. Even at the best, given a closed road, a well marked and well

(Continued on page 301)

Load Limitations for Primary and Secondary Highways*

By **CHARLES J. BENNETT**†

The topic under discussion is directly connected with the consideration of the efficiency of highway transportation, a subject which heretofore has not been very seriously studied by the majority of highway engineers.

Preliminary to discussion of this topic, it may be said, that most of us are faced in a greater or less degree with an abnormally heavy highway traffic placed upon our highways, regardless of their suitability or strength. We know that we shall be required to provide for the carrying of tremendous loads over the highways. We do not know the magnitude of these loads, nor have we any assurance of a limit, either to the weight of the unit or to the total volume of traffic to which our highways will be subjected.

It seems evident that before we can intelligently design highways, bridges or other structures, we must know the character, amount, weight and speed of vehicles which we are expected to accommodate. It would also seem axiomatic that it is not fair to ask for the development of highway systems everywhere to carry the extreme loads which are now being borne by motor trucks. This would mean expenditure of vast sums of money for the accomodation of a limited number of units. Hence, we find a need for a separation of highways into classes. For purpose of discussion, we shall assume that highways may be divided in two classes as outlined in the subject of this article.

In order to more clearly indicate the scope of the problem, we must define the terms we are using. In other words, we must answer the question: What are primary and what secondary highways? For purposes of discussion and not determination, let us roughly define primary highways as those highways connecting centers of industry, whether manufacturing or agricultural, over which must be carried commercial products in large quantities continuously at all seasons of the year. Secondary highways may be said to include all other highways than those classified as primary, or perhaps those roads which are required to carry traffic of a secondary importance—whether passenger cars or light commercial vehicles. These highways are those which eventually must serve all parts of the community and aid in the progress and development of the nation.

Roughly speaking, the routes thus classified should be so correlated and designed as to provide for the most efficient use of the motor vehicle for commercial purposes without infringing upon the field of other methods of transportation such as rail or water. Provision must be made in design, so that the primary highway systems may be expanded as the need arises without undue loss of original investment. Here we have a very large field for investigation. It is not herein intended to give an absolute solution of the problem, nor to cover all of this investigation. We have suggested the need for limitation of load, and the impossibility of improving all highways to the maximum requirement has been superficially indicated.

The restriction of loads under these suggested limitations should be further considered. In the first place, the subject must be approached not as one concerning any particular state, or group of states or any small unit of government. It must be studied as affecting the administration of all highway departments throughout the United States. In other terms, any limitations which are placed upon loads should be universal and apply to all motor vehicles whether operated in Maine or California. This, of course, implies the passage of national or uniform state laws. It can easily be seen from this statement that the problem is not one of easy solution. It requires broader study and stronger cooperation than we have yet been able to accomplish. It demands a knowledge of motor truck operation that is not yet available. It suggests numerous lines of thought which can be followed to conclusions which, when reached, can be collected together and used as information to impose restrictions as to weight and as data for design. The subject is not alone one of load limitation, but should be enlarged to cover any limitations which may be placed upon the operation of motors and loads, such as speed, width, height, length, number of units in a train, design of mechanism, etc.

Referring to a discussion held in 1918 in Chicago, at which both highway officials and motor truck manufacturers were represented, certain limitations of motor vehicles were decided. So far as the speaker is concerned, there has nothing developed since that time which would modify the conclusions there reached. These conclusions have to do with the maximum weights, widths and heights of motor vehicles, and are consequently applicable only to the primary routes which we have defined above as those which may be considered as the main media of highway transportation. The limitations thus set were a maximum gross weight of 28,000 lb. or 800 lb. per inch width of solid rubber tire. The width of the load was to be 108 in. and the maximum height, if this is correct information, 12 ft. These restrictions would allow the use of a 5-ton truck as now built, loaded to capacity, and it would seem that this is the maximum weight of truck which may be efficient for primary highways. We must realize that this limitation is not for today alone, but for the future as well, and should last for the life of the road.

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*From a paper presented at the sixth annual convention of the American Association of State Highway Officials, Washington, D. C., Dec. 13-16, 1920.

†State Highway Commissioner of Connecticut.

Until, however, we have finally completed our primary highway systems, we must modify these restrictions somewhat. In other words, we must provide for the operation of these units only at such times as they will subject the road surface to the minimum wear. We must provide some method of restricting these loads to a still smaller amount at seasons of the year when the maximum damage to highway surfaces occurs. This power, again, should be universal and in the hands of those entrusted with the care and upkeep of highways. Means must be provided whereby the maximum loads will be operated only on the primary systems.

Considering further the question of secondary highways, here we have still a larger subject, for we must provide a standard of construction and maintenance for all other highways than primary routes in order to carry a specified load. This portion of the problem is much more complicated and harder of solution than the former portion, for we must realize that we are dealing with a far larger amount of traffic over the secondary routes than over the primary routes. In other words, as we increase the restrictions on loads or amount of load, we are approaching closely to the maximum number of motor vehicles operated.

For illustration, taking a certain 20,000 commercial motor vehicles licensed, only 750 of these vehicles are in excess of 4 tons capacity, while upwards of 16,000 are less than 2 tons capacity, so that our restrictions for a secondary system of highways must be such that we shall secure the maximum efficient operation of the larger number of commercial motor vehicles. For this reason, it is suggested that the maximum allowable total load for secondary highways shall be 12,000 lb., unless the load is carried on pneumatic tires when it may be increased to 15,000 lb. We may inquire why this increase may be made. Roughly, it is thought, and experiment tends to prove, that the pneumatic tire, properly inflated, does less damage to the highway surface than the solid tire, especially when the solid tire is partly worn. It is hoped that these assumptions may be checked up in the future and more formulae developed which will be exact rather than empirical. None of the limitations suggested have taken into consideration the passenger car, as either system properly designed should properly accommodate the passenger car when load alone is considered. In general consideration of the subject as a whole, we must, therefore, conclude that limitations are necessary whatever they may be; that the information at hand is not sufficiently definite to say what the effect of certain loads may be. A careful study of this topic is imperative and is being made.

Again, we must admit that if any limitation of loads is determined upon, it must be enforced. There is no use or reason in attempting to establish destrictions on traffic, with no intention or means of enforcement. A study of this subject would not be complete, or even partially so, without a suggestion of methods of follow-up to see that the rules laid down are carried out. The writer has knowledge of many instances where laws restricting weights are written without attempt to enforce.

In order that the universal rules suggested above may be properly carried out, there will be need for cooperation among the different states in the enforcement of their licensing rules and in the checking up of the vehicles registered. Consequently, it appears that any highway system should be developed in cooperation with the motor vehicle department, and a proper policing department provided, whereby the laws regarding the use of the highway are absolutely carried out. These departments should all be built up on a standard scheme of organization.

As outlined above, this is not an attempt to solve once and for all a problem which has been presented to us. This is impossible. There are many steps ahead of us in the proper solution of this difficulty. We have only begun to realize the magnitude of the traffic which we must accommodate. Repeating again for emphasis: The problem is large and broad in its scope; its factors are unknown. We have a long tedious course of study before us until we can set down the actual facts to prove our contentions regarding the limitation of loads. To this, we must add a sincere effort to prove to the different agencies interested in highway transportation the need of some sensible and reasonable restrictions to be enforced. We have not yet faced this need with any knowledge of its magnitude. We have a long road to travel, but it must be traveled, and we must make a start. There is no time for delay.

———ooo———

The Rotary Club of Philadelphia, Pa., recently held a good roads meeting. Philip P. Sharples, Manager of the General Tarvia Department, of the Barrett Company, was the principal speaker.

Chester County, Pennsylvania, defeated the proposed $3,000,000 road bond issue at the general election. Most of the opposition to the measure came from the farmers of the county.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
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T. A. HULBERT
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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX DECEMBER 22, 1920 No. 25

FINANCING ROAD WORK

Even before the rise in cost of all commodities and of labor of every kind, incident to the Great War, the cost of road construction and maintenance had risen with the increase in volume and weight of traffic until the financing of road work had become a serious problem. And since financing is the part of road improvement with which the general public is most nearly concerned, it is highly desirable that the taxpayers should know more about it.

The fundamental principles of sound methods of financing road work are comparatively simple and have been set forth in much detail in the literature of highway engineering. In the main, they differ little from those applicable to any public work.

Though highway improvement financing is doubtless on a better basis than it was in the early days of the good roads movement, there are still too many instances of unsound practice, especially in the issuing of bonds. Enormous sums are borrowed without making adequate provisions for repayment; bonds are issued for terms longer than the life of the work they are to pay for, and the proceeds of bond issues are used to pay for work that should be paid for out of other funds.

The annual expenditure for road work in this country probably amounts to more than a half billion dollars. A considerable percentage of this sum necessarily has to be borrowed. Under the circumstances it is essential that funds from the sale of bonds should be used only for those things that ought to be paid for by that method and that bond issues should be made only in accordance with sound principles of finance.

These are matters that should be explained to the taxpayers—from whom the money must be secured. Highway engineers are in positions to do this and do it with authority. They should look upon that task as a puble duty.

ROAD LOCATION

Most existing roads are old roads—roads that were built for a traffic entirely different from that of today. As a rule, they were laid out by township or county officeholders and the location is just what might be expected.

Present-day road work consists very largely of improving these old roads. Very often a considerable amount of relocation is necessary, including sometimes long stretches of new location, but generally following the old lines as closely as possible. Where this work is under the control of states or of the larger and better organized counties, it is generally done by competent highway engineers. In other cases it is not in such capable hands.

The opening of new roads is less apt than the improvement of old roads to be handled by able engineers. Ordinarily, new roads are provided to take care of small volumes of local traffic and the work is carried out by small units, as towns, road districts or sparsely settled counties. In many such cases the units involved are too small to have well organized engineering departments and the officials do not realize the desirability of calling in an engineer.

A new highway generally attracts traffic and in time an unimportant back road may become an important thoroughfare. As soon as the volume of traffic reaches a certain point there arises a demand for improvement and the road authorities undertake work more or less commensurate with the service desired of the road. Still other betterments follow further growth of traffic and eventually the road becomes a part of a system of main roads, perhaps a link in a state-wide trunk line system.

When that time comes the highway authorities generally find that relocation is necessary in order to obtain the maximum service from the road. This means the abandonment of the old right of way in many places and the loss of the grading and drainage work that have been done as well as the loss of any possible advantage in using the settled and compacted roadbed as a subgrade for paving. Had the road been properly located in the first place the grading and the drainage structures—if well built—would need little if any attention.

Proper location costs less in the long run than building along the line of least resistance and later making a relocation. No matter how unimportant a road may seem at the time it is laid out, obtaining the services of a qualified engineer will prove a profitable investment.

Citizens of Aberdeen, Washington, Want Four New Bridges

A bridge building campaign for four new highway bridges to cost between $250,000 and $350,000, is being undertaken by members of the City Council and representatives of industrial and commercial interests of Aberdeen, Wash.

The needs of the city are outlined as including a new bridge over the Wishkah River, repair of a second bridge over this river, rebuilding of a bridge in North Aberdeen, and a new draw for the West Bridge over the Chehalis River. A new bridge over the Chehalis River is also suggested.

New York City Advertises for Street Cleaners

$5.60 a Day With Benefits of Pension, Vacation, Medical and Dental Attention

The Department of Street Cleaning of New York City is advertising for street cleaners by means of cards placed in the subway trains in the city. In these advertisements it is set forth that drivers will be paid $5.60 per day and sweepers, $5.21 per day, with benefits of pension, vacation and free medical and dental attention. Appointments, it is stated, will be made the same .day applications are filed Many opportunities, according to the advertisement, exist for quick promotion to responsible positions.

War Deartment Demands That Allegheny County Pennsylvania, Raise Bridges

It is the intention of Secretary of War Baker to enforce the decree of the War Department requiring the raising of the bridges over the Allegheny River at Pittsburgh, Pa. In answer to an inquiry as to the department's attitude, the secretary is reported to have said:

"I propose to use every power which lies in this department to require the commissioners of Allegheny County to raise the bridges. Personally, I have no feeling in the matter, and am not actuated by resentment at the very obvious intention of the commissioners to wait until the new administration comes in with the hope that my order will be reversed. But I do not like to see the power of the United States defied in this manner, and it is my intention to have the bridges raised if possible."

Delaware to Make Surveys This Winter

About 125 mi. of state roads will be surveyed during the winter by the Delaware State Highway Department. From these surveys the Highway Department will determine what sections of road will be built next season.

Road Work in Wayne County, New York

Wayne County, New York, is planning to spend $164,000 in highway improvement in 1921, of which amount $97,300 will be used for road construction and maintenance; $18,800 for bridges with spans greater than 5 ft.; $13,500 for machinery, and $35,250 for snow removal and miscellaneous work.

Heavy Rains in California Wash Out Many Bridges and Culverts

A number of bridges and culverts along roads and railways near Santa Rosa, Cal., were washed out by recent heavy rains. All rain records for years were broken, 6 in. falling during one storm and 10 in. this season.

California County To Pay $42,000 To Prevent Delay in Road Construction

Kings County, California, has offered to contribute $42,000 as a part of the cost of building 12 mi. of highway and the offer has been accepted by the California State Highway Commission. This amount represents the difference between the low bid of $412,691 for the work and the engineer's estimate. It is thought that this plan will eliminate considerable delay in building the road.

California Will Use More Convicts in Road Work

The California State Highway Commission will take necessary action to add several hundred men to the personnel of the convict road camps in the state, according to A. B. Fletcher, State Highway Engineer. Several new camps will be established so as to allow up to a thousand convicts to be employed on mountain lateral roads. At the present time there are about 220 convicts engaged in road work.

Dinner Given in Honor of Nelson P. Lewis

The sixteenth annual dinner of the Municipal Engineers of the City of New York was given at the McAlpin Hotel, on Dec. 18, in honor of Nelson P. Lewis, who recently announced his retirement as chief engineer of the Board of Estimate and Apportionment of the City of New York. Mr. Lewis has occupied his present position since 1902 and was the first president of the Municipal Engineers of the City of New York.

New York State Road Builders' Association

OFFICERS

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C. J. HENDRICKSON, Vice President	Syracuse
WILLIAM G. FOX, Treasurer	Saratoga
M. F. DUGGAN, Secretary	Albany

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W. A. GREENFIELD	Hornell
C. J. HENDRICKSON	Syracuse
J. F. PADDELFORD	Sherburne

Crusher Run

John N. Carlisle, former State Highway Commissioner, who has been practising law in Albany, N. Y., since his retirement from the department, will take a new position as head of the Northern New York Utilities Co., of Watertown, N. Y. This company controls practically all of the water power in the northern part of the state. Before coming to Albany, Mr. Carlisle lived in Watertown, where he practised law in partnership with former Senator Elon R. Brown.

The employees of the New York State Highway Department gave a dance in the hearing room of the department, Monday evening, Dec. 20. Both old-fashioned and modern dances were features of the evening's entertainment.

John W. Gurnett, a road contractor, died at his home in Watkins, N. Y., on Dec. 4. Mr. Gurnett has been one of New York State's active road builders. His last contract, a repair contract in Chemung, Schuyler, Tioga and Tompkins Counties, was awarded him on June 7, 1920. He was also prominent politically, being one of the local leaders of the Democratic party for years. He served as assemblyman from Schuyler County, during the sessions of 1905, 1906, 1910, 1911 and 1912.

The trustees of the New York State Road Builders' Association held their annual meeting on Monday, Dec. 6, at 2 p. m., at the rooms of the Association, Journal Building. The trustees are: Wm. G. Fox, Saratoga Springs, N. Y.; Fred E. Ellis, Melrose, Mass.; Thos. H. Gill, Binghamton, N. Y.; Jos. McCormick, East Providence, R. I.; W. A. Greenfield, Hornell, N. Y.; S. B. Van Wagenen, Rondout, N. Y.; A. J. Rockwood, Rochester, N. Y. President John H. Gordon addressed the meeting. Matters of importance were discussed and plans for the coming year were made.

There is a movement on foot among contractors of record in New York State, asking that Governor-Elect Nathan L. Miller, retain in office Commissioner Frederick Stuart Greene.

Commissioner Greene is a member of the committees which will give a testimonial dinner to Governor Alfred E. Smith on Dec. 30, at the Ten Eyck Hotel, Albany, N. Y.

Frederick W. Palmer, brother of Attorney General A. Mitchell Palmer, has resigned his position with the New York State Highway Department, in order to make plans for a more lucrative one.

At the meeting which was held under the auspices of the snow removal committee of the Albany Chamber of Commerce, Commissioner Frederick Stuart Greene urged the use of motor trucks and tractors equipped with caterpillar wheels. As soon as the first snow-storm arrived there could be a special staff of men ready to go to work. One group of men could work over a stretch of from 10 to 20 mi. He favors legislation which would empower the state to keep the roads open. Several thousand miles of highways in this state could be kept free from snow at a cost of approximately $1,000,000.

Engineers of the State Highway Department have begun a survey of the Ridge Road from Glens Falls to East Lake George, preparatory to improving 2.5 mi. of the proposed state road to Cleverdale. This road will run from Glens Falls to the Cleverdale summer colony at Kattskill Bay, and thence along the lake to the International Highway at Lake George Village.

Two United States Government steel boats of a fleet of four, loaded with rye, swept down the stream at the barge canal terminal near Mohawk, and crashed into the state highway bridge which forms part of the main artery of traffic between Mohawk and Herkimer. The entire structure was almost ruined. The boats went completely through the bridge, snapping the girders into splinters.

Commissioner Frederick Stuart Greene, attended the annual meeting of the American Association of State Highway Officials, which was held at Washington, D. C., this month. Commissioner Greene laid before the authorities the necessity of allowing more money per mile for highway construction. He says that $45,000 is needed, while only $40,000 is allowed.

Damage of nearly $40,000 was caused by a fire the latter part of last month in the New York State Highway Department's storehouse, at Waterford, N. Y., Division No. 2. The fire, the origin of which has not been determined, destroyed a new shed 180 ft. long, in which were stored 18 3-ton motor trucks, tools and other road machinery. The shed that burned down was built last year and is a part of a new plant that now houses 53 trucks of the department. These trucks were allotted to the state by the Government for road work at the conclusion of the war.

Massachusetts Highway Association

OFFICERS FOR 1920

JAMES C. BLAKE, President	Worcester
JOHN M. McCARTHY, Secretary	Natick
CHARLES A. BROWN, Treasurer	Wellesley

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HENRY A. SPATES	Gloucester
WILLIAM P. HAMMERSLEY,	Norwood
FRED B. RICHARDSON	Brookline

Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

A regular quarterly meeting of the Massachusetts Highway Association was held at the American House, Boston, Nov. 18, President James C. Blake presiding.

Dinner was served at 12:30 p. m.

The president presented the following applications for membership, and upon vote of the members present it was voted that the Secretary cast one vote in favor of the admission to membership of the following candidates:

Active Members: Arthur S. Blackmer, Superintendent of Public Works, Plymouth, Mass.; Harold S. Crocker, City Engineer, Brockton, Mass.; Albert H. Richardson, City Engineer, Beverly, Mass.; Robert I. Rose, Assistant Street Commissioner, Worcester, Mass.; Patrick N. Slattery, Acting Superintendent of Streets, Marlboro, Mass.

Associate Members: Samuel C. Wilson, Elgin Sales Corporation, Boston, Mass.; Harold Berkhardt, Independent Coal Tar Co., Boston, Mass.

Under a suspension of the rules it was voted that the president appoint the nominating committee for the selection of candidates for officers for the ensuing year, and the following members were appointed on this committee: Michael Driscoll, Brookline; Asa B. Prichard, Somerville; Albert T. Rhodes, Worcester; Frank B. Manning, Fall River; John M. Keyes, Concord.

After dinner the president introduced Mayor P. J. Sullivan, of Worcester, as toastmaster, and addresses were made by a number of those present.

Mayor P. J. Sullivan, Worcester, told of the methods employed by his community in snow control during the winter of 1919-20.

Stoddard B. Bates, State Highway Commissioner of Vermont, described the methods of snow control in use in that state. Mr. Bates explained to the members that the road roller of the horse-drawn type was the best method of keeping the many throughfares open, as trouble did not seem to be caused so much by snow compacted on the highways as by the loose and drifting snow.

W. L. Ulrich, Deputy State Highway Commissioner and Superintendent of Maintenance of Connecticut, explained the work done in leaving the road clear of snow in his state. Mr. Ulrich also spoke at length on the importance of having snow fences along the various open sections of the highways. These fences can be used for several seasons by being carefully taken down in the spring, painted and repaired.

John N. Cole, Commissioner of Public Works of Massachusetts gave a general outline of the plans prepared by his board. Mr. Cole advised the members present that it was a question in his mind whether or not it was the duty of the state or the cities and towns to keep the through highways open to travel during the winter months.

George Ahearn, Town Engineer and Superintendent of Streets, Arlington, and Irving Johnson, of Weymouth, told of the methods employed by them in clearing the town roads of snow last winter.

Major C. P. Fordney and Mr. Monroe, Commissioner-Engineer and Secretary-Treasurer, respectively, of the State Highway Department of West Virginia, spoke of the problems met with in the organization of their department. Both Major Fordney and Mr. Monroe said that the great trouble in West Virginia was not in the removal of the snow but in constructiing highways upon which the snow could be easily removed.

Music was furnished during the dinner. There was an attendance of 250.

The regular meeting of the North Shore Superintendents' Club was held at Wellesley Town Hall, Wednesday, Dec. 9. The association and friends were the guests of W. L. Burnett.

This meeting was an open meeting for material men and friends.

T. Parker Clark, of Winchester, called the meeting to order at 2:45 p. m., with Asa B. Prichard of Somerville acting as secretary.

The question of steam shovels for road work was the first topic discussed. Messrs. Pierce P. Condon, of Watertown, James A. Johnston, of Providence, and T. Parker Clark, of Winchester, spoke at length on the advisability of using steam shovels for excavating work on road construction. Figures showing cost of excavating work were produced to show that when conditions would permit the use of steam shovels much time and money could be saved.

At the conclusion of Mr. Johnston's remarks he was requested by Mr. Prichard to tell of some of his experiences on road work during his time of service in the World War.

Mr. Johnston explained to the members that the roads in France and Germany were superior in general to the roads in this country. There are very few roads of the Telford base type. Their roads have a surface of approximately 2 in. of tarred stone. The stone is of very soft quality in comparison with our local stone. One of the most important factors in the success of their road work is proper drainage. Where a 2-in. stone is used in this country, they use a 3 to 4-in. stone. Their roads have very little crown, averaging about $3/8$ in. per foot.

The roads in Germany are mostly of asphalt construction. They also use a very large stone which is sprinkled with water before the bitumen is applied and all liquid binders are applied by hand with a pouring pot similar to a watering can.

Each patrolman has a certain section of road to maintain. His quarters are very small, as they are moved about from one place to another on wheels, that he may be near his work at all times.

In Germany, they have been working for some time on the proposition of constructing noiseless pavements. They are very particular in patching their roads to see that the edges are cut off square and the shape of the hole is generally irregular, as they do not believe in patching a perfectly square or round hole.

In France, there are many canals along which slow freight is moved, thus relieving the highways of their heavy traffic.

T. Parker Clark spoke at length on the importance of the association taking immediate action upon the civil service bill which was introduced in the Legislature by the association. This bill was defeated and the committee consisting of Messrs. Prichard and Clark, was authorized to take action on this bill and present same to the Legislature at its opening session in January.

Luncheon was served in the selectmen's room.

Reorganization of the Massachusetts State Highway Engineering force, involving a redistricting of the state, and a number of promotions among the engineers, has been brought about by Commissioner John N. Cole, of the Department of Public Works, and the associate commissioners of the highway division, F. D. Kemp and James W. Synan. Under the new plan there are seven, instead of four, engineering divisions, each in charge of a division engineer, which, it is believed, will make possible more intimate supervision of all work on the roads on which state money is expended.

Franklin C. Pillsbury, who has been division engineer in charge of the 3d Division, has been promoted to a new post, that of construction engineer, directly related to all highway layouts and construction work carried on by the division. He is located at headquarters in the State House and is directly responsible to the chief engineer, Arthur W. Dean.

The new divisions and the engineers in charge are: (1) Berkshire County, George A. Curtis, formerly assistant in northern Berkshire; (2) Franklin and Hampshire Counties, R. B. Phillips, formerly in charge of special work in the western counties; (3) Worcester and Hampden Counties, John A. Johnston, formerly engineer in charge of old Division 1, including Berkshire, Hampden and Hampshire Counties; (4) Middlesex County, F. D. Sabin, formerly an assistant to Engineer Pillsbury in old Division 3; (5) Essex and Suffolk Counties, D. H. Dickinson, formerly an assistant in Engineer Pillsbury's Division; (6) Norfolk and Bristol Counties, Raymond W. Corburn; (7) Plymouth, Barnstable, Dukes and Nantucket Counties, W. R. Farrington, former division engineer of old Division 4 that included Norfolk, Bristol, Plymouth, Barnstable, Dukes and Nantucket Counties.

James M. Prendergast, long regarded as the father of Boston's present park system, died on Nov. 30. His ideas on the development of municipal park systems were followed in many places. He was a man of wide activities and had retired only recently in his 79th year.

Slippery pavement and the high wind that accompanied the storm on Nov. 17 were factors in an accident in which a truck belonging to a bakery company fell from the Harvard Bridge over the Charles River. In swerving to avoid another car the truck skidded, crashed through the railing and dropped 15 ft. to the edge of the embankment on the Boston side. The driver and helper escaped by jumping.

New Hampshire Good Roads Association

OFFICERS FOR 1920

WINFRED M. CHAPLIN, President	Keene
WM. J. MORRISON, Secretry and Treasurer	Keene
HARRY L. SMITH, First Vice President	Lakeport
OZMAN W. FERNALD, Second Vice President	Berlin

Board of Directors

C. M. BROOKS	Keene
WILLIAM A. GROVER	Dover
H. W. SPAULDING	Manchester

The quarterly meeting of the New Hampshire Good Roads Association was held at Keene, N. H., on Dec. 9, about 20 members being present.

The meeting was called to order by President Winfield N. Chaplin. The object of the meeting was to comply with the by-laws to elect a nominating committee for the annual election and meeting to be held at Concord, in March, 1921. The members of the committee are the following: Charles A. French, Chairman, Laconia; Will B. Howe, Concord; Elwyn Hastings, Keene; C. A. Needham, Clinton, Mass.; J. F. Neal, Merideth.

The association will hold a meeting in January just prior to the opening of the Legislature as it has several matters which no doubt will be taken up and presented to that body. This meeting will probably be held at Nashua.

Motor vehicle owners in New Hampshire are organizing to provide some means for keeping the Concord-Boston Road open to the Massachusetts line during the coming winter.

In New Hampshire there are large motor express lines operating on definite scedules from Franklin, Tilton and Laconia to Boston, others from Concord and Manchester to Boston, and several from Nashua. In addition to these lines there are progressive merchants who handle their products from Boston to their respective distributing points in New Hampshire by motor truck and they find it economical, from the viewpoint of cost of delivery, and advantageous due to the elimination of delays in railway transportation. This is especially true in the case of perishable products such as vegetables and the like.

The Abbott-Dowing Co., being the only manufacturers of motor trucks in this section of New England, have been requested by several men interested in all-year motor transportation to undertake the work of keeping the roads open from Concord to the state line at Tyngsboro, waiting the expected action of the Legislature on this problem. This motor truck company has expressed a willingness to cooperate for the general good in solving this problem without profit to itself; and several concerns interested have offered to contribute to the expenses.

It is proposed to use heavy duty motor trucks equipped with snowplows and keep them running constantly during a storm, removing the drifts and keeping the road passable. The results of this work will be to bring the farmer, merchant and manufacturer nearer to their respective markets, which makes for efficient and economical delivery of merchandise with a consequent reduction in the cost of living.

For nearly eight weeks last winter the transportation of New England, both highway and railway, was so crippled as to seriously interfere with the proper conduct of business. For a time it was practically impossible to secure shipments and several industries had to curtail production on account of their inability to secure transportation facilities. Notable among them was the Amoskeag Manufacturing Co. Such transportation facilities as were available greatly increased the cost to the manufacturer because of the delays and the necessity of tracing material by sending personal representatives at large expense to follow cars from the point of shipment to destination, and in order to get cars moved it was necessary to use extraordinary methods in certain localities. These excessive charges are necessarily included in the cost of production and passed on, like other costs, to the ultimate consumer, which inevitably increased the cost of living.

In other words, the truck delivers the material direct. In order that continuity of business may be assured through the heavy snows incidental to a New England winter, it becomes necessary to find a way to keep the roads open to motor transportation. Several states have already appropriated large sums for this work and it is carried on under the direction of the state highway department, whose operations, during the winter months are necessarily limited, due to the fact that there is no road construction or maintenance.

The Selectmen of Sunapee have been obliged to reduce the number of town electric street lights from 82 to 45 in order to bring the cost of lighting within the 1920 appropriation. The Newport Electric Light and Power Co. with power stations at Newport, Franklin and Davisville, has served notice on the selectmen that hereafter the annual cost of a light would be $18 for midnight service, an increase of $10 per light.

The total rainfall in New Hampshire has been higher during the past eleven months than in any like period recorded for many years.

To Nov. 30 the total precipitation in Manchester was 46.91 in., which is 11.39 in excess of the average for 42 years.

The first snow fall of the season occurred on Nov. 17, the storm being general throughout New Hampshire.

State Treasurer Plummer has just issued a report on the requirements of the New Hampshire state budget for 1921.

The estimates of the most of the departments call for increased expenditures which bring the total amount required during the next two years up to $2,173,528.

The Highway Department, which has had an appropriation of $275,000, now asks for an additional $100,000 for the next biennial period.

The Motor Vehicle Department expended during the last fiscal year $74,465.50, received from fees.

According to the official report of the city auditor, the City of Manchester had a deficit in 17 bureaus and departments of the city government, totalling $111,915.53, as of Nov. 1.

The deficits included the following for the Department of Public Works: Sewer maintenance, $2,571.90; sidewalk maintenance, $456.42; street cleaning, $7,735.97; transportation, equipment and supplies, $36,527.91.

Financial officials of the city government are considerably worried over the constantly mounting deficits of the various departments, but no remedy seems to be in sight.

During the past week the city found it necessary to increase the appropriations of the Department of Public Works $30,000 and it is a forgone conclusion that other departments of the city government will be compelled to ask the mayor for permission to exceed their appropriations.

The City of Manchester will probably have to get along without the Amoskeag Bridge for an indefinite period.

The Board of Aldermen has already voted $160,000 for a new bridge and Director of Public Works Shea has a contract calling for the expenditure of some $260,000 for the structure.

The mayor has the matter under consideration, but no early decision is expected.

Governor Bartlett, Secretary of the Piscataqua Memorial Bridge Commission, has received word from Secretary of the Navy Daniels that the contract has been signed, providing for the piers and abutments for the new bridge between Portsmouth and Kittery. The telegram was read at a big banquet given by Governor Bartlett and about 200 local business men to Mr. Rollins of the firm of Holbrook, Cabot & Rollins, of Boston, and his engineers who are now in this city preparing to start work on the bridge.

The gathering took place at the Rockingham Hotel and was marked by interesting remarks from many of those present, including Governor Bartlett and Mr. Rollins. The latter told of the methods which will be used in preparing and sinking the big caissons which will enable the engineers to construct the piers in the swift running waters of the Piscataqua, with a rocky bottom at a depth of 70 ft.

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Relative Value of Different Types of Rural Pavements

(Continued from page 292)

maintained detour (which combination has been a miracle so far in American highway practice) the economic loss to the traveling public has been tremendous.

For example, a road carrying a traffic of 1,000 vehicles a day is closed for a length of 5 mi., due to construction or reconstruction, for a period of four months, the detour being 8 mi. in length, a loss to traffic of 3 mi. One hundred and twenty days by 1,000 vehicles by 3 mi. gives a total traffic loss of 360,000 mi., which at 12 ct. a mile, is $43,200—which figure may well have a material bearing upon the type of pavement which one should select. Similarly derived figures will illustrate the importance of speed in construction and reconstruction and will demonstrate that it is usually worth paying for.

(To be continued)

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The City of Houston, Tex., recently passed bond issues of $425,000 for bridge and $200,000 for street improvements.

Seventeen Motor Trucks of the New York State Highway Department were destroyed by fire, according to a recent press report. The trucks, valued at $68,000, were in a storehouse at Waterford, N. Y.

The Profits of the Packard Motor Co., Detroit, Mich., for the year ending Aug. 31, amount to $6,395,468, an increase of nearly $1,000,000 over the preceding year. The company has declared a quarterly dividend 2½% on its common stock.

"The Guthrie Trail" is being suggested as the name of the road between Columbus and Madison, Ind., in honor of W. A. Guthrie, Chairman of the Indiana State Conservation Commission, who was instrumental in having this road included in the state highway system.

MEETINGS

Calendar of Coming Meetings

Jan. 19—American Society of Civil Engineers.—Annual meeting, New York, N. Y. Secretary, Charles Warren Hunt, 33 W. 39th St., New York, N. Y.

Jan. 25-27.—Associated General Contractors of America.—Annual convention, New Orleans, La Chicago, Ill.

Feb. 8-12—American Road Builders' Association.—Eighteenth Annual Convention, Eleventh American Good Roads Congress and Twelfth Good Roads Show under the auspices of the A. R. B. A., The Coliseum, Chicago, Ill. Secretary, E. L. Powers, 11 Waverly Place, New York, N. Y.

American Road Builders' Association

Many manufacturers of road building machinery, road materials and highway transportation equipment are preparing to send exhibits of their products to the Twelfth National Good Roads show to be held at the Coliseum in Chicago, February 9 to 12 next. The exposition will be one of the big features of the Eleventh American Good Roads Congress to be held in Chicago at that time in conjunction with the Eighteenth Annual Convention of the American Road Builders' Association, an organization of the public highway officials and road machinery, road materials and highway transportation men of the United States and Canada. Chicago was chosen for the congress and exposition this winter because of its central location and the splendid facilities afforded at the Coliseum for a successful show.

The president of the American Road Builders' Association this year is M. J. Faherty, President of the Board of Local Improvements of the City of Chicago. Both President Faherty and the other officers of the Association are leaving nothing undone to make the coming exposition the most notable in the organization's history. The secretary of the association recently spent several days in Chicago making the local arrangements, in conjunction with Mr. Faherty and others. More than 40,000 sq. ft. of floor space in Chicago's big exposition hall will be devoted to the exhibits, which, this year, owing to the tremendous increase in road building and street improvement work since the close of the war, promise to exceed in number and variety those of the expositions held at Boston, Pittsburgh and Chicago before the war. The interest manifested in the coming exposition is, even at this early stage, most unusual.

Many new types of road building machinery and highway transportation equipment will be shown. Demonstrations of the use of road building and street paving materials, through improved methods and under improved conditions, will be featured. The show will open Feb. 9 and will close Feb. 12. Both the congress and the exposition will occupy the Coliseum, the sessions of the congress being held on the floor immediately above that devoted to the show.

Governors of states and mayors of more than a thousand American and Canadian cities are pected to appoint delegates to attend the congress and visit the exposition. In some instances governors and mayors will head their own delegations. Officials of government, state, county and city highway departments from all parts of the United States and Canada, and from Cuba, Porto Rico, Hawaii and Alaska will attend the congress and visit the exposition, together with road, automotive and chemical engineers, contractors, agriculturists, motorists and large users of trucks, tractors and other highway transportation equipment.

Arrangements have been perfected at the Coliseum that will afford excellent facilities for displaying exhibits to advantage. Exhibits will be confined to the materials, machinery and equipment used in the construction and maintenance of roads and pavements and to publications covering that field. Power for the operation of machinery on exhibition will be supplied by the Coliseum Company. The installation of exhibits will begin on Feb. 7 in order that everything may be in readiness for opening the show at 9 a. m., Wednesday, Feb. 9. The show will close at 4 p. m. the following Saturday. The indications are that this exposition will attract large crowds each day, not only because of the central location of the convention city, but because of the intense revival of interest in good roads that followed the war.

PERSONAL MENTION

S. Benson has resigned as state highway commissioner of Oregon.

R. A. Booth has been elected chairman of the Oregon State Highway Commission.

Frank Stewart has resigned as road superintendent of Armstrong and Clarion Counties, Pennsylvania.

John B. Yeon, of Portland, Ore., has been appointed a member of the Oregon State Highway Commission, filling the vacancy caused by the resignation of S. Benson.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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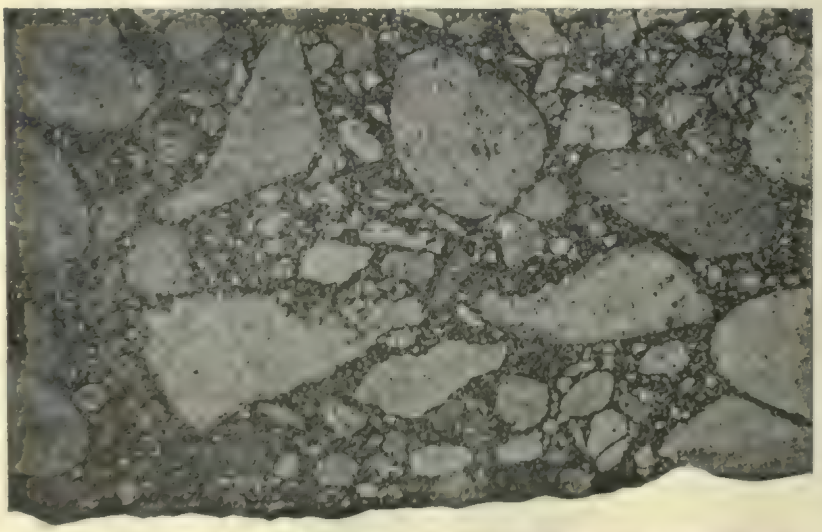

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Old Series, Vol. LVIX
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JAMESTOWN, N. Y., DECEMBER 29, 1920
Number 26

Modification of Contracts to Meet Present Conditions*

By W. R. NEEL†

In presenting for the consideration of this association a new form of contract, I wish to remove from the minds of every one any suggestion or thought that I have devised a form of "cost plus" under a new name. However, the "cost plus" contract when originally drawn embodied two fundamental principles: First that the owner or beneficiary should pay the cost of the improvement; second, that the contractor effecting the improvement should be fairly compensated for his efforts. Recognizing these two principles then, we have had as a result several forms of contracts based on these fundamentals. The cost with a percentage of whatever that cost might be to cover the compensation, commonly known as the "cost plus," is in bad repute and certainly the results of the use of this method during the late war have given every one just cause for prejudice against it. In an effort to remove the incentive to an unscrupulous contractor to increase the cost, thereby increasing his profit, the cost plus a fixed fee was tried out and proved more satisfactory to the owner and also the conscientious contractor.

My principal criticism of the cost plus a fixed fee, is that there is no incentive for the contractor to keep down the cost of the work other than a desire to secure a reputation for economical and efficient work. In public work where it is necessary to advertise and receive bids, thereby removing to a great extent the discretionary powers of the public official in selecting the contractor, something more than the two above mentioned forms of contract is needed. In attempting to embody the two fundamental principles recognized by everyone as a basis for any contract, and at the same time perfect a contract more adapted to the execution of public work, the Form "B" contract * * was written.

The original draft was submitted to a large number of people such as experienced engineers and contractors, as well as legal talent of varied ability, and changed to meet those suggestions we thought worthy of consideration.

Since initiating work under this form of contract, other changes have been made to perfect its weak points, and I wish you to understand that in submitting this to you, I am cognizant of the fact that it will probably be changed from time to time as experience in is use directs.

In approaching the demand for a new form of contract in Georgia, I was confronted with a constantly ascending scale of unit prices, each succeeding set of bids being a little higher than those preceding, until it was a question of either suspending the letting of new contracts or of devising a means of decreasing the cost of the work. I do not wish to place all the blame for the excessively high bidding upon the contractors. They in turn, were under the fear and actual conditions of constantly ascending prices for material and labor, together with the un-

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*Paper presented at the sixth annual convention of the American Association of State Highway Officials, Washington, D. C., Dec. 13-16, 1920.

†State Highway Engineer of Georgia.

**A copy of the form "B" contract was presented with Mr. Neel's paper, but is too long for reproduction in full. The general directions accompanying the contract are as follows:

When bidding on Form "B" contract the contractor should show two unit prices on the bidding sheet. Unit price "A" is the unit price on the item, which takes into consideration everything that enters into the cost, including rental of equipment and compensation. Unit price "B" includes everythng but compensaton. The total of amounts obtained at "B" unit prices will be the "cost of work" as shown in the contract.

The total amounts obtained at "A" unit prices will be the grand total amount of the contract.

The total compensation will be obtained by subtracting the cost of work from the grand total amount of the contract.

The unit price "A" is obtained by adding to the unit price "B" a percentage of this unit price "B" which will be the contractor's profit. In order to simplify the contract the amount added to the unit price "B" will be counted to the nearest cent.

On machinery rental sheets, the contractor fills in the various columns showing interest, depreciation at the percentage set forth and fills certainty of freight rates, until no one knew where he stood or how to bid. It was a gamble, as the old form of contract always has been, with the odds heavily against the contractor, and, as a consequence, the high bidding. Furthermore, everyone was affected by the many uncertainties, and the bonding companies, realizing the greater risk, demanded of the contractor higher bidding. On several occasions contractors have informed me after the bids had been rejected that they were willing to submit a lower bid, but could not secure a bond if they did so.

It, therefore, appeared to me that in order to meet ths situation, it would be necessary for the State of Georgia to carry a large part of the risk, and, briefly, the actual use of the present form of contract immediately produced the desired results in decreasing the cost of the work to the state.

The use of this form of contract does not eliminate competition. The contractor in submitting his bid, divides it into two parts—the estmated cost and the desred compensation. In order to have an incentive to keep down the cost, the contractor is allowed 25% of any saving on the estimated cost, provided it does not exceed 50% of the total compensation in the proposal, and should the cost exceed the estimate, 50% of this excess is deducted from the compensation, with the provision that the compensation must not be reduced more than 75%. Therefore, the contractor is assured of at least 25% of the compensation, as shown in his bid, for which he must furnish at his expense a superintendent and any overhead expense, such as the maintenance of his general office. It is calculated that the 25% will allow the contractor to break even, with no loss other than that of his time. The contract also provides for machinery and equipment rental, a form being provided which must be filled out and which forms a part of the contract cost of work. However, the rental schedule is fixed, and only the interest on the value of the equipment is allowed, plus a fair compensation for depreciation, insurance and estimated repairs. In this way, no profit can be made other than that shown as compensation, and this amount varies with the skill and zeal used in the prosecution of the work. Thus the minimum compensation obtainable by the contractor will be 25% of the compensation shown in the bid, and the maximum will be the compensation shown in the bid, plus an additional 50% of this amount. If the contractor should be so fortunate, the owner should not begrudge him this additional compensation, as additional compensation means a saving of 75% to the owner.

The cost of the work is paid by the owner, who is required to pay promptly all bills in order to take advantage of any cash discounts. A bonded accountant in the employ of the owner makes up pay-rolls and supervises the paying of all labor, etc. All materials are purchased by the purchasing agent of the State Highway Department, and the prices for all materials, f. o. b. railroad siding, are included in the proposal. In this way, the only financing required of the contractor is in the purchasing of equipment pertaining to the job and in paying the salary of his superintendent. This has resulted in the immediate delivery of all necessary materials for the vigorous prosecution of the work as soon as practicable after the awarding of the contract.

The contractor is called upon to furnish the necessary equipment and a skilled organization properly directed by an experienced and efficient superintendent. The elimination from the requirements of the contractors of practically all financing results in a considerable reduction in the compensation demanded by them, so that this is practically net profit to the state under this form of contract.

At first thought it might appear that the compensation of a contractor could be saved by an organization operated by the highway department, but analysis makes it evident that the item of compensation of a contractor, if conservative, would closely correspond to the operating expenses of an organization owned by the highway department, and, while it should not be the case, I am afraid in actual practice it would be hard to get supervision for a state contract in an organization working on salary that would exert the same effort in construction as would a contractor, under the Form "B" contract, where there would be an incentive, in dollars and cents, to keep the construction cost under the estimate. At the same time, the estimate must be conservative in order to meet the competitive feature.

In addition to this objection to a state construction organization, there would be the enormous investment in equipment which could only be used on state highway work, whereas, a contractor has for a field, not only state highways within the state, but in other states, as well as municipal and railroad work, etc.

(Concluded on page 308)

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in the total charge column. On paving projects a figure of 10 working months per year shall be used. Other classes of construction will have as a basis a figure of 12 workng months per year. Cost per month is obtained by dividing the total yearly charges by the estimated number of months' possible use. The amount in this column will be the monthly rate at whch the contractor will be paid for equipment owned by him. The next column is for the estimated monthly rental for equipment not owned by the contractor but which he intends to use on this job if awarded it. Estimated number of months to complete job multplied by monthly charge or monthly rent gives the total estimated machinery rental for the job. If he desires more rent on this equipment than this will amount to, it will have to be charged against his compensation and show on the contract as profit.

These are followed by a tabulation of the various kinds of work, showing in separate columns the quantity, the unit, the kind of work, unit price "B," unit price "A," amount "B," and amount "A." These are followed by the highway machinery rental sheet, consisting of a tabulation of the equipment, each item being followed by columns for the value, the charge per mile, the yearly depreciation (percentage and amount), the yearly amount (percentage) and the total yearly charges. The annual depreciation percentage is fixed for each kind of equipment, the figures being shown in the proper columns on the contract.

Relative Service Value of Different Types of Rural Pavements—II*

By A. R. HIRST†

(Continued from December 22)

Relative Cost of Service.—We have been too prone to select types of pavement on the say so of others without very material consideration of the matter of cost. The minute we commence to discuss the relative cost of pavements we are thrown into the field of economic discussion, or rather the ocean of economic discussion, at a point far beyond our depth.

We are immediately brought in contact with the question: "Should an engineer in weighing the merits of two or more types of pavement consider the factor of interest on the original investment?" Many good authorities say "Yes;" many good authorities say "No." I do not pretend to be good authority, but I am sure that the answer is "Yes." The assumption that public money when once spent is gone, and that the public should demand no return upon its investment, sounds to me like the merest bunk. The statement that the value of the pavement in increased comfort, convenience, saving in hauling, saving in gasoline, tires, etc., far offsets the interest on the investment, sounds very nice; but what is one going to do about it when one is considering two types of pavement, both of which do all of these things, but the costs of which are very dissimilar?

In addition to this little difficulty with the basic economics of the situation, we have the further trouble that in comparing the unit annual cost of various pavements, we must make assumptions as to the lives of pavements, and we have little or no information on which to base these assumptions.

It might be of some value to cite the factors entering into an economic comparison and to show just how far one can get in his figuring.

1. First Cost of the Pavement.—This is readily determinable within the limits of estimating and causes no trouble.

2. The Interest Charge on the Pavement Investment.—This charge should be compounded annually and is, of course, readily determinable.

3. The Annual Cost of Maintenance of the Pavement.—By maintenance we mean the keeping of the same kind of surface with which we started out, that is, the patching, repairs, and maintenance necessary to preserve it without reconstruction. This is only moderately guessable, because no one can tell what the cost of the material and labor entering into these repairs will be next year or in succeeding years. Furthermore, no one can guess what unexpected development of traffic may entirely upset the conditions under which the surface exists. Therefore, any estimate of the cost of maintenance per year, or for each year, is a guess.

4. Interest on the Maintenance Cost.—This interest should be added to the cost of pavement and should be compounded annually.

5. The Assumption of the Life of the Pavement before Total Reconstruction is Necessary.—Again we are in the field of the wildest theory, because the life of the pavement depends upon the traffic which it will carry through a series of years, which we can only guess at. Furthermore, on many of the pavements which are now being widely used, enough information is not available to determine what the life may be, and even on some of the older types of pavement, built under supposed-to-be-standard and fool-proof specifications, a variation of life of several hundred per cent. has been noted.

6. The summation of items 1, 2, 3 and 4, divided by the number of years of expected life of the pavement gives the annual cost to the public of the pavement so far as the mere outlay of money is concerned.

Before the division by the number of years of expected life is made, however, there should be subtracted from the total cost the value of the old pavement for use in the new pavement. Here again, we are in the realms of guesswork. Assuming that a certain type of pavement can be preserved for 20 years and will then need resurfacing or replacement by another type, we are making a grave assumption if we value the base at anything very material, because the change in traffic on rural highways is so rapid that it is very hard for one to say that the alignment or grade or culverts or structures that we are building today, or the widths that we are using today will be of any great value to our successors 20 years from now. On less important roads it is probable that structures being built today will have a very good value as a part of the structures which will replace them. But on roads of the first class there is grave doubt as to whether or not any of the surfacing will be of value to the kind of pavement that will be placed 20 years from now. A guess can, however, be made, considering all the factors surrounding the situation, and, as stated above, the sum so determined should be subtracted from the total cost in order to arrive at the annual cost.

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*Paper presented at the sixth annual convention of the American Association of State Highway Officials, Washington, D. C., Dec. 13-16, 1920.

†State Highway Engineer of Wisconsin.

At the end of this series of guesses and assumptions upon assumptions, one will have some basis, better than no basis, for comparing the annual cost of the types under consideration.

Width as a Factor in Pavement Service.—We highway engineers, when designing pavements, have been open to the same criticism that is being made against those who are seeking to concentrate the major portion of the travel on a very minor portion of all public highways. That is, we have been designing pavements of too narrow widths, and have multiplied our troubles of maintenance by confining traffic to one or two very restricted lines.

The conduct of all pavements, especially of the so-called inferior pavements, such as water-bound macadam, gravels, and the lesser non-rigid types, is good or bad in almost absolutely direct proportion as to whether they have been built wide or narrow. We have had a very large amount of discussion of the importance of drainage on highways, and I am not minimizing the importance of drainage when I state that I am convinced that many of the faults of the lesser types of surfacing, of which we are complaining, are due to the fact that we have concentrated traffic upon too small units of area, and that a better distribution of traffic will do away with much of the trouble with these types, probably a larger share than will super-refinement in the treatment of the drainage.

I believe that the superiority under traffic of the macadam highways in England and France has been due in part to superior construction, in part to the age of these highwavs. in part to lesser traffic, in part to the climate, but more largely to the greater widths used in these countries and the consequent better distribution of traffic.

I am not going to develop this thought in detail, but I believe that highway engineers will find that if they will design the so-called non-rigid roads, that is, all roads without concrete bases, of greater widths and make them flatter, very much of the trouble incident to the present use of these structures will be avoided.

We have been too prone to compare rigid pavements of a certain width, with non-rigid pavements of the same width, rather than comparing rigid pavements of the same cost (I mean total annual cost per mile) with non-rigid pavements of the same cost.

A supposed-to-be two track concrete or other rigid surface road, built 14, 15 or even 16 ft. wide on a main traveled highway, has its service value gravely reduced by its inadequate width because it breeds disastrous accidents and causes worry at all times. The shoulder maintenance is also a constant source of worry and a grave expense if traffic is at all heavy. Furthermore, the absolute concentration of traffic and the crowding to the extreme edges brought about by such widths reduce the effective life of the pavement very materially. It is our opinion that even the rigid types of pavement must provide for a moderate distribution of traffic if they are to hold. The minimum two track highway is 18 ft.; and 20 ft. is better on principal highways. If municipalities cannot finance these widths they had better build part of their lengths of a cheaper type, pending the securing of more money, building what they now build of proper widths.

Plastic or viscous surfaces of all kinds must have width to allow for traffic distribution, especially if built in a climate of great total variation in temperature. On these types, especially, traffic must be distributed so as to heal its own marks and not deepen them in heated periods.

On primary highways, unless convenient detours are available, all pavements which, from their nature require frequent surface attention embarrassing to traffic, should be constructed wide enough so that they can be maintained and repaired one-half at a time.

Design and Service Value.—The service value of any kind of pavement depends largely upon proper design. It is not only necessary that the pavement be properly drained, that it be built of the proper depth and width, but the materials in it must be properly sized and prepared.

For instance, a gravel road built of uncrushed and unscreened gravel, varying in size from sand to cobble stones as large as one's head, has practically no service value today, because it is impossible to maintain such a road so as to give satisfactory service to traffic. On the other hand, a road built of the same width and depth and of the same gravel properly crushed and sized may well give most economical service. We, in Wisconsin, have reached the point where we don't want any gravel within 4 in. of the surface larger than 1 in., and we prefer to have no gravel in the whole structure larger than 1 in. The smaller the gravel the better, our experience indicates.

The service value of any highway may be seriously impaired by the use of sharp and dangerous curves, poor alignment, narrow bridges and culverts, heavy grades and unnecessary lengths. A well laid out highway of inferior surface will many times give better service value than a sloppily laid out highway built with the best surface. Expressed in terms of real service value, type means little unless the selection of a proper type is supplemented by proper design and proper layout.

Maintenance as a Service Factor.—It is well known that I am positively a crank on the subject

(Continued on page 308)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XX DECEMBER 29, 1920 No. 26

AWARDING CONTRACTS TO "THE LOWEST RESPONSIBLE BIDDER"

In awarding contracts for road work, the highway official is generally obliged, either by law or by custom, to let them to "the lowest responsible bidder." And since often the ony test for "responsibility" that he can apply is the exacting of a certified check, the contract goes to the lowest bidder without regard to responsibility, ability or any other real qualification.

This practice is admittedly bad. It has probably caused more serious trouble than has incompetence, dishonesty or any other one thing. Originally intended to be a bar to collusion between contractors and officials, in practice it frequently has been a bar to efficient and economical work and not always much hindrance to the few crooked road builders who have made any serious attempt to evade it.

The end sought in all contract work is the best obtainable job at the lowest cost. There is no legal or moral obligation upon a state, county or other administrative unit to put its work on the open market. Road and street officials who are competent know what contractors have ability and integrity and they should have authority to award contracts to those contractors and to exclude others from participation in work.

Fortunately, these conditions are being adjusted satisfactorily by the elimination of irresponsible and financially incapable contractors, for road work has assumed proportions that call for ability and financial responsibility on the part of those who undertake it.

SELLING ROAD BONDS.

Business conditions during the past year have made it increasingly difficult to dispose of bond issues voted for road betterments. The result has been no little retarding of work included in some important improvement program.

As a rule, road bonds bear less than 5% interest. With plenty of sound investments yielding 7 or 8%, or even more, it is not surprising that those interested in good roads have been casting about for some means of inducing investors to buy. In a few cases this has resulted in raising the interest rates, but that is not always possible. Moreover, the increases that have been made have not all been sufficient to enable the bonds to compete with other securities.

It has been suggested in these columns that recourse be had to Liberty Loan methods of selling. Why not try it?

Road improvement is a matter of very general interest and of universal benefit. The average citizen should be willing to put up some of the money; he will be if he can be made to realize how vital good roads are to him.

ENGINEER AND CONTRACTOR

The relations between engineer and contractor—real and ideal—are popular subjects of discussion at most gatherings of road builders and these exchanges of opinion probably have done much to engender a better understanding and to secure cooperation.

The difficulties of engineers and contractors usually result from the interpretation of specifications for the performance of work in a manner "satisfactory to the engineer." While it is right that the engineer, who is the representative of the authority for whom the work is being done, should pass upon its acceptability, it does not follow that he should dictate every detail of the methods adopted for doing the work. The specifications should describe minutely and clearly the result to be achieved and should lay squarely upon the engineer the responsibility of passing upon that result. But they should also allow the contractor the greatest possible latitude in the selection and application of methods and equipment.

Drawing specifications in accordance with this principle would go far towards securing hearty cooperation between the engineer and contractor.

Modification of Contracts to Meet Present Conditions

(Concluded from page 304)

One of the first advantages in this new form of contract is that it permits honest contractors of small means to show their ability on a larger scale than would be possible under the old form under which a surety bond is required for the full amount of the contract, which many contractors of small means are unable to make. At the same time, the facilities of financing this Form "B" contract open a field for intelligent, honest bidders who would otherwise be unable to participate in a project of very great magnitude, except as sub-contractors, although their ability might be ample to handle the project. A striking example of this is a recently completed concrete paving project. The successful bidders could not have financed a project of this extent under the old form of contract and yet they have had charge of the construction of more miles of concrete pavement within the state than any other contractor.

The result has been that 5.5 mi. of 18-ft. concrete pavement were laid in 3¼ months at a 15% net saving on the contract, as awarded. The contractors not only earned their compensation as set forth in their bid, but an additional 50%, the maximum amount permissible. The advertisement for the letting of this contract, as is our custom, called for bids under both forms of contract. The successful bid was on Form "B", and was 24% less than the next lowest bid which was on the old form of contract, and it, therefore, resulted in an actual net saving of practically 30% under the Form "B" as against the standard form of contract.

Project 1-A, F-2—concrete—pavement is showing a saving of 11.3% on first estimate.

Federal Aid Project No. 162, a grading job, shows a saving of 13.2% and the work has been under way for more than three months.

The contracts now under way in Georgia under the Form "B" amount to over $1,500,000 and a saving of a little over $20,000 has been effected in bond premiums alone, as a minimum bond is required under this form of contract.

The supervision that is required under the Form "B" contract by the owner requires a very high class man, preferably one with experience as an inspector on the old form contract and also experience as a contractor, or superintendent for a contractor. His duties are to watch for violations of the contract and to catch the leakages on the job. The former duty should be performed subconsciously, but most of his thoughts should be centered on methods to reduce the cost. The cost sheet tells him a very true story and should be kept up to date so that he can see at a glance where he should put most of his attention.

I will conclude by stating that, in my judgment, this form of contract requires a more intelligent insight into construction details and a more thorough knowledge and analysis of cost by the engineer than the old form.

Relative Service Value of Different Types of Rural Pavements

(Continued from page 306)

of proper maintenance. We believe that maintenance is the keystone of the entire structure of pavement service. Proper selection, design, layout, performance of construction, must be immediately followed by intense maintenance if the potential service value of a pavement is to be secured. Any discussion of the service value of any type of pavement has no basis unless the assumption is made that good maintenance protects the pavement and gives it a chance to serve. Types seemingly unsuited for the traffic may well, when properly maintained, give better service than a much more suitable surface left to care for itself. We are all familiar with the necessity of proper maintenance and outside of this slight mention I will leave it.

Traffic Distribution on Several Roads.—I am going to interject just a word or two on this important topic. We are too inclined to view future traffic developments entirely upon the assumption that one road between two points is going for all time to serve all traffic between these points. I doubt that this is true. Alternate routes will be developed and traffic thus distributed. This will be good from many standpoints. It will prevent traffic congestion, allow the use of cheaper surfacings, accommodate more local traffic, provide a choice of routes, and allow for repairs and reconstruction without closing all available routes. The road problem of America is not to build a few boulevards; it is to build, maintain, and keep always open a transportation system.

Traffic and Maintenance Costs.—Wisconsin has now maintained her 5,000-mi. state trunk highway system for three years and over 2,000 additional miles for one year, and we have gained some idea of the maintenance cost of various types. The condition of the various sections varied so much when they were taken over, and the relative service given by the various sections and by the various types is so dissimilar, that very little can be determined from an inspection of our figures on maintenance costs.

In 1919 the average cost of maintenance per mile of all types, surfaced and unsurfaced, was $254. The average cost of maintenance per mile by types (taken from a large number of sections) was as follows: Earth, $223; gravel, $212; water-bound macadam, $516; penetration macadam, $252; concrete, $337. Qualifying these figures, it would be only fair to say that the earth road maintenance included much heavy blade grader reconstruction; that the water-bound macadam had been allowed to get badly out of repair; and that all but $62 of the $337 for concrete was used in shoulder and ditch maintenance and in applying gravel to shoulders on the too narrow 16-ft. surfaces.

As indicating the possible value of well maintained gravel roads we segregated nine very satisfactory patrol sections of gravel road and tabulated at least two separate traffic counts on each. The average count on these roads was 1,059 automobiles, 44 trucks, 21 motorcycles and 48 horse-drawn vehicles per day. Weight was not taken. No effort was made to get maximum day counts. The roads in question gave excellent service every day in the year. The average cost per mile per section for maintaining these nine patrol sections was $263. These roads were not surface treated.

Our experience with gravel roads indicated that when well built of adequate widths with fine crushed materials and well maintained, their traffic limit is far higher than has been hitherto assumed.

The above figures may be of some interest, although we have ourselves not been able to draw more than broad inferences as to possible service limits and costs from them and other similar compilations.

(To be continued)

Committee Appointed to Draft West Virginia Highway Bill

Five members of the House and Senate of the West Virginia Legislature were appointed on Dec. 5 by Governor Cornwell to draft legislation providing for the issuance of $50,000,000 of bonds for highway improvement. The committee is composed of F. F. Saunders, of Huntington; George W. McClintick, of Charleston; J. S. Zimmerman, of Romney; E. H. Morton, of Webster Springs, and E. B. Stewart of Morgantown.

Chicago Pays $348,500 for Strauss Bridge Patent Infringement

Following seven years of litigation in the federal courts, the City of Chicago, Ill., has paid to the Strauss Bascule Bridge Co., the sum of $348,500 in settlement for infringement of the Strauss patent by ten bridges in that city.

The principle involved in the design of the Strauss bascule truss does away with the interference of the inside trunnion supports with the leaf or counterweight and permits the introduction of a cross girder without interfering with its full opening, on which the trunnions are mounted. Accordingly, sufficient space is obtained for a counterweight of necessary volume at a relatively low cost.

Snow Fences to be Erected on Milwaukee and Racine Road

The highway commissioners of Milwaukee and Racine Counties, Wisconsin, are planning to erect snow fences along the road between the cities of Milwaukee and Racine. The cost of the fences will be paid by the two counties and the Milwaukee, Racine and Kenosha interurban railway.

Complaints were filed with the county and state highway officials because of the condition of this road during the winter and it was decided that snow fences should be built.

Highway Program of Stark County, Ohio

The 1921 highway program of Stark County, Ohio, calls for the construction of 46 mi. of roads, involving an expenditure of $1,640,000. During 1920 road construction was hampered because of inability to secure road materials and the unstable condition of the bond market.

The program as prepared by the county commissioners includes 36 mi. of county roads, the cost of which will be paid by the county, the townships benefited and the taxpayers, and 10 mi. of intercounty highways, half of the cost of which will be borne by the state.

Highway Work in Montana

The annual report of the Montana State Highway Commission, now under preparation, shows that the commission has work under contract amounting to $6,481,952. In addition, plans have been completed for 24 projects for improving 124 mi. of road, involving a cost of $1,524,727. These projects will be advertised as soon as the counties provide for financing them.

In the three years preceding 1920, the commission surveyed 486 mi. of road. In 1920 about 932 mi. of roads were surveyed. During the three preceding years, detail plans were completed for 147 mi. and in 1920 the same work included 849 mi.

Michigan Counties Plan Snow Removal

Highway officials from 20 counties in southeastern Michigan met recently in Detroit with representatives interested in highway transport, at the call of State Highway Commissioner Frank F. Rogers, and a comprehensive plan of snow removal was formulated. Each county commissioner was asked to designate those trunk highways which should be kept free from snow this winter and a program was made from these data calling for a complete system of through routes which will not only touch every locality but which also provide outlets for every factory in this section.

State Highway Commissioner Rogers intends to inaugurate the same plan for snow removal in other parts of the state.

EQUIPMENT—TRADE—MATERIALS

Shipping and Storing Road Building Materials in Winter and Early Spring

Present Conditions in the Contracting Field and on the Railways—Suggestions for their Improvement Resulting from an Investigation Made by the Lakewood Engineering Company

The road building season in the northern states is from May to November—about six months. The average contractor, however, is able to build roads only about half of this time, for he has to contend with rainy weather; some of his men may fail to show up for work some mornings; a piece of equipment may go wrong; he may not have material, etc., etc. There are a hundred and one things that may happen on a road job to delay it, and as a result, the end of the season finds the contractor with only 75 to 100 actual working days to his credit.

The contractor is constantly trying to anticipate and prevent these delays. He adopts methods and plans his work to overcome as far as possible delays because of rains. To eliminate labor trouble he buys modern machinery that does work formerly done by hand. But his biggest delays have been because the railroads have not delivered material to him regularly during the construction season.

If the roads which are needed and wanted are to be built, something must be done to assure the contractor when he starts work in the spring that he wil have his materias when they are needed. It is useless to expect him to build any considerable mileage of roads when he has to shut down his work every few days waiting for sand, stone or cement.

For that reason, the Lakewood Engineering Company sent letters to contractors, highway engineers, banks, chambers of commerce, railway officials, and others interested or concerned with the country's highway program, pointing out that if road materials were transported and stored during the winter and early spring months when open top cars are more available than they are during the construction season, the contractors could proceed with considerable less interruption and their working season would be increased accordingly.

A great many replies have been received to these letters. Most of them are in hearty accord with the plan suggested and offer help in making it a success. Several letters tell what has already been done along this line. For instance, at Ogden, Utah, materials for 20 mi. of road were shipped in last winter, and this road was completed during the past season in record time. The State of Delaware has followed this practice for three years.

The Board of Freeholders of Passaic County, New Jersey, has acquired a central storage yard for stockpiling road materials this winter. An Illinois city, Belleville, has already stored cement for next season's work.

It is surprising that the idea is aparently new to many. It was strongly urged last year by several state highway departments, as well as the U. S. Bureau of Pubic Roads. Nevertheless, many of the letters which we have receved indicate that the idea is a new one in many parts of the country.

The replies which have been received now make it possible to analyze the subject in detail from the viewpoint of everyone interested, taking into consideration the arguments against, as well as the arguments for. This analysis follows:

The Supply of Open Top Cars and Its Relation to Road Construction

Road building materials are usually shipped in open top or gondola cars. In the northern states, the greatest demand for these cars comes in the summer months when they are required for handling coal, ore, sand and stone for construction work and road building, etc.

In a few instances it has been ponted out by railway executives that on their own particular lines this condition does not exist and these cars are more in demand in the fall, winter, and early spring months than during the summer. However, taking the country as a whole, it is a fact that there is generally a shortage of open top equipment in the summer, and a surplus in the winter. One reason for this is because the navigation season on the Great Lakes closes in November for the transportation of coal and ore. Many cars are needed for this service during the summer and early fall.

At the close of the navigation season, these cars are released, and for a short time are busy carrying coal to the local territory which can be served after the Lake trade is taken care of. But this local service is practically at an end by the last of December when there begins to accumulate a surplus of open top equipment. The transportation of coal slumps off rapidly after this time, as coal contracts are made on April 1st, and from January until that time there is only a very small amount of this busi- for the railroads.

It has been the general practice to request shipments of road materials during the actual construction season. The result has been that the railroads are always contending with a peak load just at the time the contractor could do his most effective work if he were able to get his materials. The inability of the railroad to furnish the necessary cars very often makes it impossible for the contractor to get well started on his work, with the result that the close of the season finds him with a job which must be carried over until next year.

On the other hand, if the surplus cars which are available during the winter and spring months could be put at work hauling materials to be stored by the contractor until his season opens, he would be assured of steady work when he did get it under way.

Financing the Transportation and Storage of Materials Ahead of Time

The questions most frequently asked about the early transportation and storage of road building materials are: How is the contractor to pay for the materials and for their transportation? And why should he contract for materials at the present prices when there may be a possibility of a decline in price?

A number of states, recognizing the advantage of the early transportation and storage of materials, have made it possible to pay the contractor, in full or in part, for material when it is delivered. This can now be done in the following states:

Alabama
Arkansas
California
Colorado
Connecticut
Delaware
Georgia
Idaho
Illinois
Iowa
Kansas
Maine
Maryland
Minnesota
Michigan
Nebraska
New Hampshire
New York
Rhode Island
South Dakota
Tennessee
Virginia
West Virginia
Wisconsin
Wyoming
District of Columbia
Oregon
Vermont

In ten other states such procedure is not possible at the present time under existing statutes.

In only three states is there any sentiment against this proceeding.

In those states where it is not possible for the highway departments to make such payments, it will of course be necessary for the contractor to finance the transportation and storage of materials ahead of time. In such instances, he will have to arrange with his banker for the needed funds. But even if he does have to borrow the money, there is every reason why he should do so. The interest on the amount required is absolutely insignificant when compared to the sum the contractor will lose if he should have to shut down his job even a few days because he could not get regular delivery of material during the construction season.

There now seems no possible reason to look forward to lower prices for materials next year. Freight rates have increased, and a larger demand for material is expected. The demand is increasing in many localities faster than the supply. Freight rates and the law of supply and demand are the two principal factors governing price. Therefore, it does not seem that material prices will go down. Yet even if there were hope for a decline by next season, the extra cost to the contractor buying his materials for winter and spring storage would really be only a small insurance premium guaranteeing that he would not have to close down his work every few days to wait for materials. Such slight extra cost is mighty cheap insurance.

The banks of the country are more than willing to help. A contractor needing financial assistance to aid him in shipping and storing materials early should not hesitate to go to his banker. Money loaned for this purpose is really backed by the security of the state for which the road is to be built. And what better security could be wanted?

Freezing Weather Will not Prevent Winter and Spring Shipments of Road Material

The difficulty of unloading sand or stone which has frozen in transit is an objection which is frequently raised to the shipment of road materials during the winter months.

It is true that these materials may freeze in the cars, but material for road construction is shipped generally only a comparatively short distance, and such freezing will be confined to a thin crust unless the cars are delayed in transit or unloading. The proper unloading equipment will make it possible to get the material out of the cars in a minimum amount of time, which will prevent it from freezing solid.

Where material is delayed, and becomes frozen in severe weather it, of course, will be necssary to employ steam pipes or to apply heat in some other way to thaw it before it can be handled from the cars. But such procedure is far from impossible.

In the fall it is not possible to continue actual paving where the subgrade freezes slightly at night. Although the temperature during the day may not be below freezing, the contractor will not be permitted to place concrete. But such weather is ideal for continuing unloading and storing materials for next season's work.

In some of the northern states, where very severe weather prevails, it would, of course, be necessary to withhold shipments during extremely cold weather, because even though they were transported for only a short distance, they might become frozen solid in a very short time under such conditions.

However, in such states where these conditions do prevail, it is possible to ship materials at all times except during the dead of winter.

Quarries Often Do Not Supply Material During the Winter Months

Many quarries close down during the winter months; therefore, an argument has been made that materials will not be available for winter shipments.

So far as we are able to learn, the quarries close down largely because of habit. There has been no active market for them during the winter months. They have preferred to stop their work instead of assuming the burden of stocking their materials until the next season. If a market could be assured for the quarries, which would absorb their output, there is no reason why they should not operate twelve months out of the year, with the exception of time required to make repairs.

What Can Be Done to Encourage Early Transportation and Storage of Road Materials

Everyone who is interested in the completion of highway projects which have been planned, can accomplish much good by bringing this subject to the attention of those actively concerned with the contemplated improvements. The more publicity that can be given to the entire proposition, the better. Such publicity will lead to further discussion, and such discussion will generally bring out the advisability of this practice.

MEETINGS

Jan. 19—American Society of Civil Engineers.—Annual meeting, New York, N. Y. Secretary, Charles Warren Hunt, 33 W. 39th St., New York, N. Y.

Jan. 25-27—Associated General Contractors of America.—Annual convention, New Orleans, La., Chicago, Ill.

. **Feb. 8-12—American Road Builders' Association.**—Eighteenth Annual Convention, Eleventh American Good Roads Congress and Twelfth Good Roads Show under the auspices of the A. R. B. A., The Coliseum, Chicago, Ill. Secretary, E. L. Powers, 11 Waverly Place, New York, N. Y.

American Assoiation of State Highway Officials

Secretary of Agriculture Meredith delivered the opening address at the sixth annual convention of the American Association of State Highway Officials, held Dec. 13-16 at the Washington Hotel, Washington, D. C. Secretary Meredith stated that he greatly favored continuation of federal aid appropriations, calling attention to the inclusion of such recommendation in his annual report to the President.

A resolution, introduced by C. M. Babcock, Commissioner of Highways of Minnesota, providing for the appointment of a committee to urge upon Congress further federal aid appropriations, was passed on Dec. 14. The following day this committee, together with a delegate from each state, appeared before the Congressional Committee to ask for further federal aid legislation. Other resolutions were passed asking federal appropriations for research to be used with equivalent appropriations by the states, and further distribution of surplus war equipment.

The program, as printed recently in Good Roads, was carried out with little change, and many of the papers brought forth extended discussion. Daniel Willard, President of the B. &O. R. R., who was scheduled to speak on the 1921 railroad situation, was unable to be present.

Eastern Paving Brick Manufacturers' Association

The annual meeting of the Eastern Paving Brick Manufacturers' Association was held at the Waldorf-Astoria Hotel, New York City, on Dec. 14 and 15, with representatives of the various paving brick companies in the East in attendance. R. L. Winslow, of New York City, was elected president; R. T. Hutchins, of Wheeling, W. Va., treasurer, and W. C. Perkins of Philadelphia, secretary.

Associated General Contractors

Considerable attention will be given to the discussion of road building problems at the second national conference of the Associated General Contractors, to be held at New Orleans, La., Jan. 25-27. Sectional meetings will be held and the following subjects will be discussed at the Highway Contractors' Division: "Highway Contracts and Specifications", "Federal Control of Highway Construction", "Compensation Insurance", "Cement", and "Problems of 1921."

PERSONAL MENTION

John R. Thompson has resigned as county road engineer of McCracken County, Kentucky.

H. K. Ihrig has been placed in charge of the engineering department of the Heltzel Steel Form & Iron Co., Warren, O.

H. C. Andrews has been appointed assistant engineer of the Department of Public Works of Raleigh County, West Virginia.

G. M. Williams, formerly Associate Engineer of the U. S. Bureau of Standards, is now a professor of engineering in the University of Saskatchewan, Canada. Mr. Williams has done considerable research work on concrete.

The Pennsylvania State Highway Department has built 354 mi. of highways during this season, up to Oct. 30, according to a recent report.

Coal Car Priority Orders have been amended so that territory west of the Mississippi River is released from the exclusive use of open-top cars in handling coal. This releases many cars to other industries whose car supply has been curtailed, especially that of highway construction.

CONTRACT NEWS

CONTRACTS PENDING—REPORTED IN PREVIOUS ISSUES*

Date of Letting		See GOOD ROADS Issue of
	ROADS AND STREETS	
12–29	Columbia City, Ind. Grading, draining and gravel paving	12–22
12–29	Columbus, Ind. Grading, draining and paving	12–22
12–29	Princeton, Ind. Grading, draining and stone or gravel paving	12–22
12–29	Leavenworth, Kan. Grading and culverts	12–25
12–30	Huntingburg, Ind. Macadam roads	12–25
12–20	Omaha, Neb. Brick, concrete, sheet asphalt or Warrenite-Bitulithic pavement	12–22
1– 1	Monticello, Ind. 12 roads	12– 1
1– 1	Wadena, Minn. Paving	12–22
1– 1	Paknee City, Neb. Paving	12– 1
1– 1	Warrior Run, Pa. Paving	12– 1
1– 2	Duluth, Minn. Graveling and concrete culverts	11–10
1– 3	Brookville, Ind. Grading, draining and stone paving	12–22
1– 3	Fowler, Ind. Grading, draining and gravel paving	12–15
1– 3	Jeffersonville, Ind. Grading, draining and macadam and crushed limestone paving	12–22
1– 3	Knox, Ind. Grading and draining	12–15
1– 3	Rensselaer, Ind. Highway	12–22
1– 3	Rockport, Ind. 2 highways	12–15
1– 3	La Junta, La. Concrete, asphaltic concrete or bitulithic paving	12–15
1– 4	Bloomfield, Ind. Macadamized road	12–22
1– 4	Crawfordsville, Ind. Grading, draining and gravel paving 2 roads	12–15
1– 4	Delphi, Ind. Grading, draining and gravel and macadam paving	12–22
1– 4	Lebanon, Ind. Road improvement	12–22
1– 4	Logansport, Ind. Highway improvement	12–22
1– 4	Madison, Ind. Road improvement	12–22
1– 4	Martinsville, Ind. Grading, draining and gravel paving	12–22
1– 4	Princeton, Ind. Grading, draining and stone or gravel paving	12–22
1– 4	Terre Haute, Ind. Grading and draining	12–15
1– 4	Wabash, Ind. Grading, draining and gravel paving	12–15
1– 4	Kalamazoo, Mich. Shaping, draining and graveling	12–22
1– 4	White Cloud, Mich. Shaping, draining and graveling	12–22
1– 5	Colorado Springs, Colo. Paving	10–20
1– 5	Shelbyville, Ind. Grading, draining and gravel and crushed stone paving	12–22
1– 5	Austin, Minn. Graveling	12–22
1– 5	Quebec, P. Q. Paving	12– 8
1– 6	Warsaw, Mo. 3 mi. road	12–15
1– 7	Howell, Mich. Shaping, draining and graveling	12–22
1–10	Grand Rapids, Minn. 20 mi. road	12–15
1–15	Carson City, Nev. 15 mi. state road	12–15
1–17	Elwood, Ind. Road machinery	12–22
1–27	Kingston, Mo. 3 mi. road	12–15
2– 1	Boulder, Cal. Repaving	12–15
2– 1	Lawrenceville, Ill. Paving on concrete base	12– 8
3– 1	Toronto, Ont. Grading and culverts	11–10
	BRIDGES	
12–29	Leavenworth, Kan. Bridges	12–15
12–29	Lansing, Mich. Bridge	12–15
12–29	Lansing, Mich. Bridge	12–22
12–30	Helena, Mont. Steel span bridge on concrete piers	12–22
12–30	Raleigh, N. C. Bridges	12–22
1– 3	Brookville, Ind. Bridge	12–22
1– 7	Jacksonville, Fla. Viaduct	12– 8
1– 8	Miami, Fla. Double leaf bascule bridge	12– 1
1–11	Hamilton, Ont. Superstructure of single leaf Strauss trunnion bascule bridge	12–22
1–12	Lansing, Mich. Bridge	12–22
1–17	Burlington, Ia. Bridge	12–22
2– 7	Bainbridge, Ga. Concrete bridge	11–17

*Items preceded by ✱ are noted for the first time and are not included in above table.

Bids Asked and Prospective Work

***Camden, Ala.**—Bids will be received by the Co. Comrs. of Wilcox Co., until Jan. 3, for the construction of hard surfaced road, between Four-Mile Hill and Boykin Bridge.

***Savannah, Ga.**—Bids will be received by the City until Jan. 12, for the construction of 7,900 sq. yd. of sheet asphalt, vitrified brick, asphaltic cement and plain concrete pavement; also for the construction of 55,600 sq. yd. of vibrolithic concrete pavement on Broad St. Address J. W. Mott, Dir. of Pub. Wks.

***Sullivan, Ill.**—Bids will be received by the Co. Comrs. of Moultrie Co., until March 1, for road work. Address T. C. Fleming, Supt. of Highways.

***Taylorville, Ill.**—Bids will be received by the City, until Feb. 15, for street repairs. Address J. W. Dappaert, Engr

***Anderson, Ind.**—Bids will be received by the Bd. of Co. Comrs. of Madison Co., until Jan. 15, for the improvement of a highway in Anderson Twp. Plans and specifications on file at the office of Henry P. Hardie, Co. Aud.

***Cannelton, Ind.**—Bids will be received by the Bd. of Co. Comrs. of Perry Co., until noon, Jan. 3, for grading, draining and paving with limestone on 2.25 mi. of road in Troy Twp. Plans and specifications on file at the office of T. A. Lasher, Co. Aud.

***Jeffersonville, Ind.**—Bids will be received by the Bd. of Co. Comrs. of Clark Co., until 10 a. m., Jan. 7, for grading, draining and constructing a macadam, pavement on 2. 48 mi. of highway in Union Twp. Plans and specifications on file at the office of Thomas L. Stoner, Co. Aud.

***Rockport, Ind.**—Bids will be received by the Bd. of Co. Comrs. of Spencer Co., until 2 p. m., Jan. 3, for the construction of a road in Ohio Twp. Plans and specifications on file at the office of R. W. Richards, Jr., Co. Aud.

***Rockville, Ind.**—Bids will be received by the Bd. of Co. Comrs. of Parke Co., until 1 p. m., Jan. 4, for grading, draining and constructing gravel surface on 10,208 ft. of road in Washington Twp. Plans and specifications on file at the office of Ralph E. Porter, Co. Aud.

***Warsaw, Ind.**—Bids will be received by the Bd. of Co. Comrs. of Kosciusko Co., until 10 a. m., Jan. 4, for grading, graveling or macadamizing on a road in Jackson Twp. Plans and specifications on file at the office of Tom J. Nye, Co. Aud.

***New Orleans, La.**—Bids will be received by the State Nighway Dept., at its office, Room 332, Maison Blanche Annex, until noon, Jan. 10, for the construction of Sec. B, Baton Rouge-New Orleans Highway, .95 mi., Ascension Parish, and New Iberia-Burke Highway, 4.60 mi., Iberia Parish. Plans and specifications on file at the above office. Address Duncan Buie, State Highway Engr.

***Cadillac, Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., at the Dist Office of the State Highway Dept., Haskins Block, until 1:30 p. m., Jan. 6, for shaping and constructing a 12-ft. gravel surface on 1.011 mi. of State Trunk Line Rd. No. 14-25, Sec. C, Roscommon Twp., Roscommon Co. Plans and specifications on file at the above office and office of the State Highway Dept., Lansing.

Bids will be received by Frank F. Rogers, State Highway Comr., until 1:30 p. m., Jan. 6, for shaping and constructing a 16-ft. gravel surface on 2.968 mi. of State Trunk Line Rd. No. 63-2, LeRoy Twp., Osceola Co. Plans and specifications on file at the above office and office of the State Highway Dept., Lansing.

Madison, Minn.—Plans have been prepared for 40,000 sq. yd. of paving. Address M. T. Hoff, Village Clk.

Minneapolis, Minn.—Construction of a road between Minneapolis and Forest Lake, 23 mi., planned by the Co. Comrs. of Hennepin Co. Address H. R. Chase, Chmn. of the Bd.

***Hernando, Miss.**—Bids will be received by the Bd. of Co. Comrs. of DeSota Co., at the office of the Chancery Clk., until Jan. 11, for the construction of 2 mi. of Federal Aid Project No. 94. Plans and specifications on file at the above office and office of the State Highway Engr., Jackson. Address H. C. Dietzer, State Highway Engr.

***Moberly, Mo.**—Bids will be received by the Bd. of Co. Comrs. of Randolph Co., until Jan. 20, for the construction of 1.66 mi. of concrete road. Address Mark Holman, Co. Clk.

***Columbus, O.**—Bids will be received by the State Highway Comr., until 10 a. m., Dec. 31, for the following work:

Federal Aid Project No. 109, Clark Co. on Secs. M and Donnelsville of the National Rd., I. C. H. No. 1, Petition No. 4030 in Bethel Twp.; for grading 32-ft. roadway, constructing bridges and culverts and 32,822.6 ft. of 16-ft. pavement of bithulithic, brick, reinforced concrete and Kentucky rock asphalt; estimates bithulithic, $380,436.05, brick, (including brick). $404,996.17, brick (state to furnish brick), $304,076.62, reinforced concrete, $401,374.78, Kentucky rock asphalt, $350,748.55.

Federal Aid Project No. 117, Crawford Co. on Sec. H of the Bucyrus-Upper Sandusky Rd., I. C. H. No. 200, Petition No. 3856 in Holmes and Tod Cos.; for grading 28-ft. roadway, constructing bridges and culverts and 21,577 ft. of 16-ft. pavement of brick, bituminous concrete on concrete base, bituminous concrete on water-bound base, brick; estimates brick, (including brick on concrete base) $258,549.03, brick, (state to furnish brick) $190,456.39, bituminous concrete on concrete base, $241,890.76, bituminous concrete on water-bound base, $223,146.48, brick (including brick on water-bound base) $266,582.03, brick, (state to furnish brick) $198,489.39.

Darke Co. on Sec. A of the Greenville-Covington Rd., I. C. H. No. 208, Petition No. 3969 in Greenville and Adams Twps.; for grading 26-ft. roadway, constructing bridges and culverts and paving 32,670 ft. with reinforced concrete; estimate $337,568.20.

Darke Co. on Sec. B of the Greenville-Covington Rd., I. C. H. No. 208, Petition No. 3970 in Adams Twp.; for grading 26-ft. roadway, constructing bridges and culverts and 16,907.4 ft. of 16-ft. pavement of reinforced concrete; estimate $169,076.18.

Defiance Co. on Sec. C of the Bryan-Defiance Rd., I. C. H. No. 305, Petition No. 3410 in Noble Twp.; for grading 29-ft. roadway, constructing bridges and culverts and 9,444.7 ft. of 18-ft. pavement with Kentucky rock asphalt; estimate $81,714.91.

Franklin Co. on Sec. P of the Columbus-Sandusky Rd., I. C. H. No. 4, Petition No. 3765 in Clinton and Sharon Twps.; for grading 64-ft. roadway, constructing drainage structures and 10,675 ft. of 50-ft. pavement of brick; estimates brick (including brick) $380,490.29, brick (state to furnish brick) $291,428.69.

Federal Aid Project No. 176, Guernsey Co. on Sec. F of the Cambridge-Newcomerstown Rd., I. C. H. No. 352, Petition No. 3369 in Cambridge Twp.; for grading 26-ft. roadway, constructing drainage structures and 18,409 ft. of 16-ft. concrete pavement; estimate $195,584.06.

Federal Aid Project No. 176, Guernsey Co. on Sec. F Liberty of the Cambridge-Newcomerstown Rd., I. C. H. No. 352, Petition No. 3369 in Liberty Twp., for grading 28-ft. roadway, constructing drainage structures and 8,830 ft. pavement; estimate $69,606.48.

Hocking Co. on Sec. K of the Logan-Athens Rd., I. C. H. No. 155, Petition No. 3669 in Green Twp.; for grading 26-ft. roadway, constructing bridges and culverts and 18,412 ft. of 16-ft. pavement of brick on water-bound base, monolithic brick; estimates brick on water-bound base, $178,687.58 and monolithic brick, $179,675.43.

Federal Aid Project No. 190, Madison Co. on Sec. C of the National Rd., I. C. H. No. 1, Petition No. 4124 in Jefferson and Deer Creek Twps.; for grading 30-ft. roadway, constructing bridges and culverts and 28,826 ft. of 16-ft. pavement of Kentucky rock asphalt or bituminous macadam; estimates Kentucky rock asphalt, $178,808.20, bituminous macadam, $174,763.80.

Federal Aid Project No. 190, Madison Co. on Sec. D-2 of the National Rd., I. C. H. No. 1, Petition No. 4128 in Deer Creek and Somerford Twps.; for grading 30-ft. roadway, constructing bridges and culverts and 23,950 ft. of 16-ft. pavement of Kentucky road asphalt or bituminous macadam; setimates Kentucky rock asphalt, $145,114.05, bituminous macadam, $141,508.05.

Federal Aid Project No. 89, Madison Co. on Sec. G of the Columbus-Washington C. H. Rd., I. C. H. No. 50, Petition No. 3772 in Pleasant Twp.; for grading 38-ft. roadway, constructing bridges and culverts and 5,242 ft. of 16-ft. pavement of bituminous macadam; estimate $36,640.92.

Federal Aid Project No. 89, Madison Co. on Sec. N of the Columbus-Washington C. H. Rd., I. C. H. No. 50, Petition No. 3773 in Pleasant Twp.; for grading 26-ft. roadway, constructing bridges and culverts and 7,547.5 ft. of 16-ft. pavement of bituminous macadam; estimate $50,992.55.

Muskingum Co. on Sec. O of the Zanesville-Dresden Rd., I. C. H. No. 344, Petition No. 3793 in Muskingum Twp.; for grading 26-ft. roadway, constructing drainage structures and 25,779.2 ft. of 16-ft. pavement of monolithic brick; estimate $272,860.78.

Muskingum Co. on Sec. M-1 of the Zanesville-Caldwell Rd., I. C. H. No. 348, Petition No. 3794 in Wayne Twp.; for grading 26-ft. roadway, constructing drainage structures and 7,779.4 ft. of 15-ft. pavement of brick; estimate $71,092.93.

Muskingum Co. on Sec. F-1 of the Zanesville-New Lexington Rd., I. C. H. No. 350, Petition No. 3795 in Newton Twp.; for grading 26-ft. roadway, constructing drainage structures and 16,634.6 ft. of 16-ft. pavement of brick on sandstone or slag base; estimate

$181,210.41.

Federal Aid Project No. 35, Portage Co. on Sec. V of the Ravenna-Warren Rd., I. C. H. No. 332, Petition No. 3462 in Charlestown and Paris Twps.; for grading 26-ft. roadway, constructing bridges and culverts and 16,580 ft. of 16-ft. pavement of water-bound macadam, estimate $93,493.07.

Putnam Co. on Sec. M of the Van Wert-Ottawa Rd., I. C. H. No. 435, Petition No. 4107 in Monterey Twp.; for grading 26-ft. roadway, constructing bridges and culverts and 15,125 ft. of 16-ft. pavement of Kentucky rock asphalt on water-bound base; estimate $112,402.31.

Putnam Co. on Sec. Ottoville of the Van Wert-Ottawa Rd., I. C. H. No. 435, Petition No. 4107 in Monterey Twp.; for scarifying old 28-ft. roadway, placing pipe, and constructing 3,139 ft. of 18-ft. pavement of Kentucky rock asphalt on water-bound base, estimate $22,986.32.

Federal Aid Project No. 164, Richland Co. on Sec. J of the Ashland-Shelby Rd., I. C. H. No. 148, Petition No. 3874 in Jackson Twp.; for grading 26-ft. roadway, constructing bridges and culverts and 16,600 ft. 16-ft. pavement of bituminous macadam; estimate $119,387.91.

Federal Aid Project No. 162, Seneca Co. on Sec. K of the Tiffin-Republic Rd., I. C. H. No. 449, Petition No. 3841 in Clinton Twp.; for grading 26-ft. roadway, constructing drainage structures and 13,600 ft. of 15 and 16-ft. pavement of bituminous macadam or brick, estimates bituminous macadam, $101,030.02, brick (including brick) $129,161.06, brick, (state to furnish brick) $96,470.18.

Federal Aid Project No. 188, Stark Co. on Sec. D-1 of the Alliance-Minerva Rd., I. C. H. No. 78, Petition No. 4136 in Washington Twp.; for grading 32-ft. roadway, constructing bridges and culverts and 7,473.1 ft. of 16-ft. pavement of brick; estimates brick (including brick) $91,184.90, brick (state to furnish brick) $72,584.50.

Stark Co. on Sec. D of the Navarre-Berlin Rd., I. C. H. No. 79, Petition No. 4015 in Sugar Creek Twp.; for grading 30-ft. roadway and constructing 13,126 ft. of 15-ft. pavement of brick; estimate $109,953.95.

Trumbull Co. on Sec. H of the Niles-Ashtabula Rd., I. C. H. No. 150, Petition No. 3917 in Mecca and Greene Twps.; for grading 26-ft. roadway, constructing bridges and culverts and 27,150 ft. of 16-ft. pavement of bituminous macadam; estimate $170,595.70.

Trumbull Co. on Sec. A-2 of the Canfield-Niles Rd., I. C. H. No. 328, Petition No. 3928 in Weathersfield Twp.; for grading 26-ft. roadway, constructing bridges and culverts and 6,945 ft. of 20-ft. pavement of brick; estimate $98,540.05.

Federal Aid Project No. 77, Williams Co. on Sec. Stryker of the Bryan-Wauseon Rd., I. C. H. No. 297, Petition No. 4014 in Springfield Twp.; for grading roadway, constructing bridges and culverts and 7,256 ft. of pavement of bituminous concrete or Kentucky rock asphalt; estimate bituminous concrete, $106,316.20; Kentucky rock asphalt, $106,316.20.

Wyandot Co. on Sec. L of the Marion-Upper Sandusky Rd., I. C. H. No. 113, Petition No. 3873 in Pitt Twp.; for grading 26-ft. roadway, constructing bridges and culverts and 18,800 ft. of 16-ft. pavement of asphaltic concrete; estimates asphaltic concrete (concrete base) $177,033.56, asphaltic concrete, (macadam base) $168,550.86.

Plans and specifications on file at the offices of Resident Engr. and State Highway Dept. Address A. R. Taylor, Highway Comr.

***St. George, S. C.**—Bids will be received by the Bd. of Co. Comrs. of Dorchester Co., until Jan. 4, for the construction of 12.917 mi. of road between Reevesville and Dorchester. Plans and specifications on file at the offices of D. L. McAlhany, Secy. of the Bd., Ambrose Harwell, Div. Engr., 39 Broad St., Charlestown, and State Highway Engr., Columbia.

***San Antonio, Tex.**—Bids will be received by the Co. Judge of Bexar Co., until 11 a. m., Jan. 6, for reconstructing a gravel road and constructing a 1-in. bituminous topping on the Bandera Road, State Highway No. 27. Address C. E. Hoff, Engr.

Bids Received and Contracts Awarded

Star City, Ark.—Contract for the construction of 13 mi. of gravel road, awarded to General Construction Co., Little Rock, at $325,000.

Fresno, Cal.—Contract for the construction of 19,983 sq. yd. of Warrenite-Bitulithic pavement on 3½-in. concrete base, awarded to Thompson Bros. Co.

Des Moines, Ia.—Contract for graveling 8 mi. of Granger Rd., awarded by the Co. Comrs. of Polk Co., to E. L. Hughes, Des Moines.

Webster City, Ia.—Contract for grading 11 mi. of Grand Highway, awarded by the Co. Comrs. of Hamilton Co., to C. A. Barnes, Des Moines, at $35,000.

Salina, Kan.—Contract for grading 1.989 mi. of road, awarded by the Co. Comrs. of Saline Co., to W. B. Stingley, Manhattan, at $10,968; also for constructing culverts, awarded to J. W. Norton, Salina, at $8,898.

Passaic, N. J.—Contract for leveling and grading of Elgersman St, awarded to J. D. Napoli, Hackensack, at $1,117.40.

Ashtabula, O.—Contract for the construction of road between Bushnell and Andover, awarded to T. P. Fitsgerald, at $35,000.

Cuyhoga Falls, O.—Contract for paving and curbing awarded to Columbus Asphalt Paving Co., at $75,000.

Beaver, Pa.—Contracts for the construction of highways have been awarded by the State Highway Dept. as follows: 4,375 ft. to J. B. Reed Co., McKee's, at $77,221.30; 3,641 ft. to S. B. Markey, New Brighton, at $59,849.25; 11,097 ft. to S. B. Markey, New Brighton, at $149,322.75.

Providence, R. I.—Contract for bituminous road surfacing in Foster, awarded by the Bd. of Water Supply, to B. Perini & Bros. Co., Ashland, Mass., at $103,270.

Columbia, S. C.—Contract for the construction of the road between Florence Co. and Cross Hill, through Darlington Co., awarded to L. A. Chitwood, at $10,000.

Richmond, Tenn.—Contract for improving Standard Ave. and a portion of German Blvd., awarded by the City Council, to L. L. Page, at $16,854.08.

Center, Tex.—Contract for 18 mi. of gravel surfacing and 17.5 mi. of grading and bridges on Highway No. 22, Shelby Co., awarded to Smith Bros., Crockett, at $319,409.70.

Daingerfield, Tex.—Contract for the construction of 10.68 mi. of Highway No. 1-A, Morris Co., awarded to C. W. Burgess, Dallas, at $84,787.22.

Dallas, Tex.—Contract for paving Ewing Ave., awarded to the Texas Bitulithic Co., at $184,191.

Fort Worth, Tex.—Contract for the constructino of 133,452 sq. yd. of Warrenite-Bitulithic pavement on 5-in. concrete base, awarded to Texas Bitulithic Co., Dallas.

Houston, Tex.—Contract for the construction of 2,300 sq. yd. of Warrenite-Bitulithic pavement on 6-in. concrete base, awarded to Gulf Bitulithic Co., Houston.

Sherman, Tex.—Contract for grading, surfacing and draining 7.37 mi. of Jefferson Highway 11, awarded by the Comrs. of Grayson Co., to Womack Construction Co., Sherman, at $74,896.

BRIDGES

Bids Asked and Prospective Work

***Bradentown, Fla.**—Bids will be received by the Co. Comrs. of Manatee Co., until Jan. 3, for repairing the bridge between Sarasota Bay and Sarasota Key. Plans and specifications on file at the above office and office of B. M. Canty, Sarasota. Address William M. Taylor, Co. Clk.

***Cannelton, Ind.**—Bids will be received by the Bd. of Co. Comrs. of Perry Co., until noon, Jan. 3, for the construction of 2 bridges in Troy Twp. Plans and specifications on file at the office of T. A. Lasher, Co. Aud.

***Centerville, Ia.**—Bids will be received by the Bd. of Co. Comrs. of Appanoose Co. in Feb., for the construction of one 80-ft. and one 60-ft. pony truss bridges, one 32-ft. and two 20-ft. I-beam bridges, one 8x8, one 5x5, one 4x4 and one 3x3 concrete box culverts. Plans and specifications on file at the office of J. B. McNeal, Co. Aud. Address F. L. Davis, Engr.

***Ellsworth, Kan.**—Bids will be received by the Co. Clk. of Ellsworth Co., until Jan. 10 for the construction of a 30-ft. reinforced concrete through girder bridge in Mulberry Twp., and a 35-ft. bridge in Langley Twp., involving 419 cu. yd. concrete and 22,856 lb. reinforcing steel. Address B. Story, Engr.

***Brandon, Miss.**—Bids will be received by the Bd. of Co. Comrs. of Rankin Co., until Jan. 1, for the construction of bridges on Federal Aid Project No. 18, between Jackson and Hattiesburg. Work involves 18,000 lin. ft. piling, 14,000 ft. B. M. lumber, 24.27 cu. yd. class A concrete, 8.32 cu. yd. class C concrete, 1,750 lb. reinforcing steel. Plans and specifications on file at the offices of State Highway Engr., Jackson, and the Chancery Clk. Address H. C. Dietzer, State Highway Engr.

***Caruthersville, Mo.**—Bids will be received by the State Highway Comn., until Jan. 28, for the construction of the following: I-beam superstructure over drainage ditch on Sta. 260 involving 84.5 cu. yd. class C concrete, 470 lb. reinforcing steel, and 11,700 lb. fabricated structural steel; estimate $5,596—I-beam superstructure over drainage ditch on Sta. 255 involving 132.2 cu. yds. class C concrete, 500 lb. reinforcing steel and 17,200 lb. fabricated structural steel; estimate $8,177—I-beam superstructure over drainage ditch on Sta. O involving 90.4 cu. yd. class C concrete, 500 lb. reinforcing steel and 13,700 lb. structural steel; estimate $6,090.

***Lima, O.**—Bids will be received by the City, until Jan. 4, for the construction of a concrete bridge over the Ottawa Riv. at Elm St. Plans and specifications on file at the office of City Engr. Address Elmer McClain, Dir. of Pub. Wks.

***St. George, S. C.**—Bids will be received by the Bd. of Co. Comrs. of Dorchester Co., until Jan. 4, for the construction of one 60-ft. and one 100-ft. bridges between Reevesville and Dorchester. Bids will be received on concrete trestle bridges on timber piles and concrete pile and creosoted timber pile bridges. Plans and specifications on file at the offices of D. L. McAlhany, Secy. of the Bd., Ambrose Harwell, Div. Engr., 39 Broad St., Charlestown, and State Highway Engr., Columbia.

***Burlington, Ont.**—Bids will be received by the Dept. of Pub. Wks., until Jan. 11, for the construction of a 202-ft. superstructure of single leaf Strauss trunnion bascule bridge over the Burlington Channel; estimate $125,000. Address E. Lafleur, Engr.

Bids Received and Contracts Awarded

Manchester, Ia.—Contract for the construction of reinforced concrete deck ribbed arch bridge, to consist of two 87-ft. spans, 26-ft. roadway and two 5-ft. sidewalks, awarded by the Co. Comrs. of Delaware Co., to Miller-Fifield Construction Co., Waterloo, at $43,988.

Lawton, Okla.—Contract for the construction of bridges and culverts, awarded by the Co. Comrs. of Comanche Co., to Boardman & Co., Oklahoma City, at $39,000.

Victoria, B. C.—Contract for the construction of the substructure of the Johnson St. Bridge awarded to F. M. Preston, at $177,376.

BONDS

Chicago, Ill—Election planned in Feb, to vote on $7,500,000 bond issue for the construction of bridges. Address P. S. Combs, City Engr.

Kings Mountain, N. C.—Issue of $18,000 bonds for paving streets planned. Address the Mayor.

Sheboygan, Wis.—Issue of $200,000 bonds voted for the construction of bridge on 8th St. Address C. U. Boley, City Engr.

Quebec, P. Q.—Issue of $569,000 bonds have been voted for the construction of pavements. Address W. D. Baillairge, City Engr.

MISCELLANEOUS

***Baldwin, Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., at the office of the Bd. of Co. Road Comrs. of Lake Co., until 1:30 p. m., Jan. 7, for stocking 4,800 cu. yd. of base course gravel on 3 mi. of State Trunk Line Rd. No. 63-3, Sec. B, Peacock Twp. Specifications on file at the above office and offices of the State Highway Dept., Haskins Block, Cadillac, and State Highway Dept., Lansing.

***Wenatchee, Wash.**—Bids will be received by the City, until Jan. 4, for the purchase of a 6,000 gal. steel tank flusher wagon. Address James J. Smith, City Clk.

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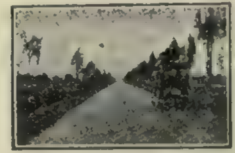

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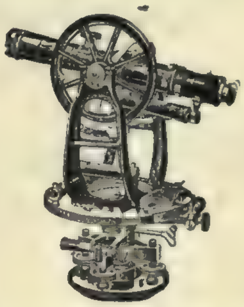

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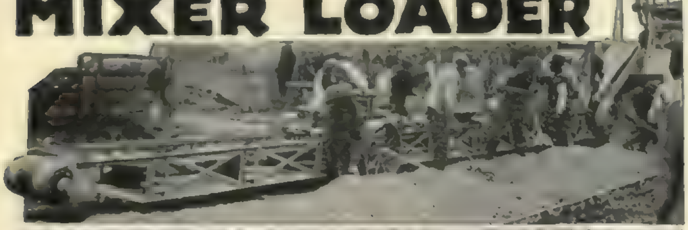

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